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Proceedings of the American Academy of Arts and Sciences.

VOL. 69. NO. 13.—FEBRUARY, 1935.

RECORDS OF MEETINGS, 1933–1934.

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1. BANKS, NATHAN.—The Psammocharidae of the Philippines. pp. 1–117. January, 1934. $1.60.
2. BARNETT, S. J.—The Rotation of Cobalt and Nickel by Magnetization and the Gyromagnetic Ratios of their Magnetic Elements. pp. 119–135. January, 1934. $0.45.
3. SMITH, LEIGHTON B , KEYES, FREDERICK G., AND GERRY, HAROLD T.—The Vapor Pressure of Water. Part II. Steam Research Program. pp. 137–168. January, 1934. $0.65.
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6. DAVENPORT, C B., STEGGERDA, MORRIS, AND DRAGER, WILLIAM.—Critical Examination of Physical Anthropometry on the Living. pp. 265–284. February, 1934. $0.45.
7. SMITH, LEIGHTON B., AND KEYES, FREDERICK G.—The Volumes of Unit Mass of Liquid Water and their Correlation as a Function of Pressure and Temperature. Part III. Steam Research Program. III–A. The Compressibility of Mercury from 30° to 300° C. pp. 285–314. April, 1934. $0.60.
8. PROCTOR, BERNARD E.—The Microbiology of the Upper Air. I. pp. 315–340. August, 1934. $0.60.
9. WHEELER, WILLIAM M., AND CREIGHTON, WILLIAM S.—A Study of the Ant Genera Novomessor and Veromessor. pp. 341–387. September, 1934. $0.90.
10. BEATTIE, JAMES A.—The Apparatus and Method Used for the Measurement of the Compressibility of Several Gases in the Range 0° to 325° C. pp. 389–405. November, 1934. $0.45.
11. CRAWFORD, F. H., AND TSAI, P. M.—New Bands of the Ionized Nitrogen Molecule. pp. 407–437. January, 1935. $0.60.
12. PARKER, G. H., BROWN, F. A., JR., AND ODIORNE, J. M.—The Relation of the Eyes to Chromatophoral Activities. pp. 439–462. January, 1935. $0.60.
13. RECORDS OF MEETINGS; Biographical Notices; Officers and Committees; List of Fellows and Foreign Honorary Members; Statutes and Standing Votes, etc. pp. 463–624. February, 1935. $2.00.

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RECORDS OF MEETINGS.

One Thousand Two Hundred and Seventh Meeting.

OCTOBER 11, 1933.—STATED MEETING.

The Academy met at its House at 8.25 P. M.

The PRESIDENT in the Chair.

There were present seventy-nine Fellows and sixteen guests.

The records of the meeting of May 10 were read and approved.

The Corresponding Secretary reported the receipt of letters accepting Fellowship from Gordon W. Allport, Philip Bard, Harold K. Barrows, William N. Bates, George H. Bigelow, Harry A. Bigelow, Henry W. Biklé, George H. Blakeslee, Campbell Bonner, Edwin M. Borchard, Charles F. Brooks, Carleton Brown, Harold H. Burbank, Benjamin N. Cardozo, Frank M. Carpenter, James McKeen Cattell, Charles Collens, Robert T. Crane, Cyrus E. Dallin, Alden B. Dawson, John Dickinson, Jesse Douglas, Curt J. Ducasse, Carl Engel, Louis F. Fieser, Reginald Fitz, Henry T. Fowler, Sheldon Glueck, Theodore F. Green, Learned Hand, Halford L. Hoskins, Edgar E. Hume, Walter S. Hunter, George B. Kistiakowsky, Hans Kurath, Leo R. Lewis, Frank R. Lillie, Ivan M. Linforth, Lee S. McCollester, Edward S. Mason, James V. May, Arthur E. Norton, Howard R. Patch, Carroll C. Pratt, Edward Sapir, Josef A. Schumpeter, George C. Shattuck, David S. Smith, Harlan F. Stone, Marshall H. Stone, William I. Thomas, Henry W. Underwood, Jr., Soma Weiss, Frederic L. Wells, Frank E. Winsor, Harry A. Wolfson, Jeffries Wyman, Jr., Henry A. Yeomans; and of letters accepting Foreign Honorary Membership from Rafael Altamira y Crevea, Gösta A. Bagge, Frantz Dahl, François Geny, Jaroslav Heyrovsky, Sir Arthur Keith, Hans Kelsen, Juljusz Makarewicz, Friedrich Meinecke, Georg E. Müller, Fritz Paneth, Werner Sombart, Hans Spemann, Rudolf Stammler, Sir Josiah Stamp, and Giorgio Del Vecchio; also of a letter from Arthur Winslow, resigning Fellowship.

The Corresponding Secretary announced that the Council had made the following grants from the Permanent Science Fund:

1. To Charles V. Green, Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Maine, $500, to aid in his studies of tumor inheritance:

2. To Gleason W. Kenrick, Tufts College, $500, for apparatus and assistance to aid him in studying the Kennelly-Heaviside Layer:

3. To Bret Ratner, N. Y. U. Bellevue Medical College, New York City, $500, to assist him in his study of the anaphylactogenic properties of certain materials:

4. To V. M. Slipher, Director of the Lowell Observatory, Flagstaff, Arizona, $750, to aid in a study of the spectra of the planets.

The President announced the death of six Fellows:—Irving Babbitt (Class IV, Section 4), Arthur Powell Davis (Class I, Section 4), Henry Walcott Farnam (Class III, Section 3), Edward Furber Miller (Class I, Section 4), Arthur Kingsley Porter (Class IV, Section 4), John Eliot Thayer (Class II, Section 3); and of two Foreign Honorary Members:—Robert Seymour Conway (Class IV, Section 3), Viktor Goldschmidt (Class II, Section 1).

The President called attention to the original notification of his election to membership in the Academy sent to Dr. James Thacher, of Plymouth, in 1803, and signed by John Adams as President and John Quincy Adams as Corresponding Secretary, which has been loaned to the Academy by Miss Mary R. Hodge.

The Fellows elected in May were then presented to the Academy.

The following communication was presented:

Mr. Edward V. Huntington: "A Simplified Theory of the Figure of the Earth," illustrated with lantern slides.

Four papers were read by title: "Gyromagnetic Experiments on the Process of Magnetization in Weak Fields," by S. J. Barnett; "The Application of Methods of Geometrical Inversion to the Solution of Certain Problems in Electrical Resonance," by W. G. Cady; "The Lower Permian Insects of Kansas. Part 6," by F. M. Carpenter; "Methods and Procedures used in the Massachusetts Institute of Technology Program of Investigation of the Pressures and Volumes of Water to 460° C.," by F. G. Keyes.

The meeting was dissolved at 9.25 P. M.

One Thousand Two Hundred and Eighth Meeting.

NOVEMBER 8, 1933.—STATED MEETING.

The Academy met at its House at 8.20 P. M.

The PRESIDENT in the Chair.

There were present fifty-six Fellows and six guests.

The records of the meeting of October 11 were read and approved

The Corresponding Secretary announced that the Council had reappointed Mr. J. D. M. Ford for four years as a delegate of the Academy to the American Council of Learned Societies.

He also reported the receipt of letters accepting Fellowship from John Gilbert Beebe-Center, John Alden Carpenter, George Burgess Magrath, Albert Warren Stearns, Abbott Payson Usher, and George Benson Weston; and of a letter declining Fellowship from Charles Herbert Woodbury.

The President announced that the Rumford Medals voted to Dr. Harlow Shapley at the May meeting will be presented to him at an adjourned meeting of the Academy to be held in conjunction with the American Association for the Advancement of Science in December.

The following communication was presented:

Mr. Kenneth J. Conant: "The Monastery at Cluny," illustrated with lantern slides.

Four papers were read by title: "The Rotation of Cobalt and Nickel by Magnetization and the Gyromagnetic Ratios of their Magnetic Elements," by S. J. Barnett; "The Psammocharidae of the Philippines," by Nathan Banks; "The Purification and Physical Properties of Organic Compounds. III. The Specific Heat of Solids just below the Melting Point as a Criterion of Purity," by Evald L. Skau, presented by F. G. Keyes; "The Vapor Pressure of Water. Part 2. Steam Pressure Program," by Leighton B. Smith, Frederick G. Keyes, and Harold T. Gerry.

The meeting was dissolved at 9.50 P. M.

One Thousand Two Hundred and Ninth Meeting.

DECEMBER 13, 1933.—STATED MEETING.

The Academy met at its House at 8.25 P. M.

The PRESIDENT in the Chair.

There were present forty-two Fellows and three guests.

The records of the meeting of November 8 were read and approved.

The Corresponding Secretary reported the receipt of a letter from Dr. Stanley Cobb, resigning Fellowship.

The President announced the death of two Fellows: James Arnold

Lowell (Class III, Section 1) and Lyman Churchill Newell (Class I, Section 3).

The following communication was presented:

Mr. Jerome C. Hunsaker: "Recent Evolution in Airships," illustrated with lantern slides.

Two papers were read by title: "The Synthesis of Ammonia in the Electrodeless Discharge," by Walter C. Schumb and Louis Goldman; "Studies on Histomoniasis, or 'Blackhead' Infection, in the Chicken and the Turkey," by E. E. Tyzzer.

On motion of Mr. A. E. Kennelly the Academy adjourned at 9.25 P. M. to meet on December 30 at the Hotel Statler with the American Association for the Advancement of Science for the presentation of the Rumford Medals to Dr. Harlow Shapley.

One Thousand Two Hundred and Tenth Meeting.

DECEMBER 30, 1933.—ADJOURNED MEETING.

The Academy met in the Ball Room of the Hotel Statler at 8.30 P. M. in conjunction with the American Association for the Advancement of Science.

The PRESIDENT in the Chair.

The President introduced Mr. Arthur E. Kennelly, Chairman of the Rumford Committee, who, after giving an account of the Rumford Premium and stating the grounds on which the present award was made, presented the Rumford Medals to Dr. Harlow Shapley.

Dr. Shapley delivered an address on "The Anatomy of a Disordered Universe."

The meeting then adjourned.

One Thousand Two Hundred and Eleventh Meeting.

JANUARY 10, 1934.—STATED MEETING.

The Academy met at its House at 8.15 P. M.

The PRESIDENT in the Chair.

There were present forty-five Fellows and nine guests.

The records of the meeting of December 13 were read and approved.

The President announced the death of two Fellows: John Candler Cobb (Class III, Section 3) and Everett Morss (Class III, Section 4).

On motion of Mr. Neal, it was

Voted, That the President appoint a committee to consider a proposal made by the Committee on Membership, involving an amendment to the Statutes.

The following communication was presented:

Dr. Elliott C. Cutler: "The Relation of the Thyroid Gland to Disease of the Heart," illustrated with lantern slides.

The meeting was dissolved at 9.40 P. M.

One Thousand Two Hundred and Twelfth Meeting.

FEBRUARY 14, 1934.—STATED MEETING.

The Academy met at its House at 8.15 P. M.

The PRESIDENT in the Chair.

There were present forty-five Fellows and six guests.

The records of the meeting of January 10 were read and approved.

The President reported the receipt of letters resigning Fellowship from William Y. Elliott and Arthur M. Schlesinger.

The President announced the death of William Morris Davis, Fellow in Class II, Section 1, and of Fritz Haber, Foreign Honorary Member in Class I, Section 3.

Mr. Neal, on behalf of the committee appointed by the President, moved that the Statutes be amended so that Article 2 of Chapter II, shall read as follows:

"The number of Fellows shall not exceed Eight hundred, of whom not more than Six hundred shall be residents of Massachusetts, nor shall there be more than Two hundred and twenty in any one Class," (instead of Two hundred and ten).

and it was so *Voted.*

The following communications were presented:

Mr. William Hovgaard: "The Fundamentals of the Theory of Relativity."

Mr. Kirsopp Lake: "Dated Greek Minuscule Manuscripts," illustrated with lantern slides.

The following papers were read by title: "Critical Examination of Physical Anthropometry on the Living," by C. B. Davenport, Morris Steggerda, and William Drager; "The Volumes of Unit Mass of

Liquid Water and their Correlation as a Function of Pressure and Temperature. Part III of the Steam Research Program," by Leighton B. Smith and F. G. Keyes; "The Compressibility of Mercury from 30° to 300° Centigrade. Part III A of the Steam Research Program," by L. B. Smith and F. G. Keyes.

The meeting was dissolved at 9.55 P. M.

One Thousand Two Hundred and Thirteenth Meeting.

MARCH 14, 1934.—STATED MEETING.

The Academy met at its House at 8.20 P. M.

The PRESIDENT in the Chair.

There were present thirty-five Fellows and three guests.

The records of the meeting of February 14 were read and approved.

On the recommendation of the Council the following appropriations were made for the ensuing year:

From the income of the General Fund, $7,450, to be used as follows:

for General and Meeting expenses	$ 800
for Library expenses	2,000
for Books, Periodicals, and Binding	1,500
for House expenses	2,200
for Treasurer's expenses	950

From the income of the Publication Funds, $3,017.77, to be used for publication.

From the income of the Rumford Fund, $3,230, to be used as follows:

for Research	$2,000
for Books, Periodicals, and Binding	350
for use at the discretion of the Committee	880

From the income of the C. M. Warren Fund, $821.75, to be used at the discretion of the Committee.

The President announced the appointment of the Nominating Committee:

Roland G. D. Richardson, of Class I
Hervey W. Shimer, of Class II
Roscoe Pound, of Class III
Albert C. Knudson, of Class IV

The following communications were presented:

Mr. Milman Parry: "Some Processes of Oral Poetic Composition Observable in Southslavonic Heroic Poetry," illustrated with lantern slides.

Mr. B. E. Warren: "Arrangements of Atoms in Liquids and in Glasses," with lantern illustrations.

The meeting was dissolved at 10.10 P. M.

One Thousand Two Hundred and Fourteenth Meeting.

APRIL 11, 1934.—STATED MEETING.

The Academy met at its House at 8.20 P. M.

The PRESIDENT in the Chair.

There were present thirty-one Fellows and eight guests.

The records of the meeting of March 14 were read and approved.

The Corresponding Secretary announced that the Council had made the following grants from the Permanent Science Fund:

1. To J. C. Boyce, Massachusetts Institute of Technology, $400, for aid in investigating the extreme ultra-violet spark spectra of the rare gases krypton and xenon:

2. To T. T. Chen, University of Pennsylvania, $90, to permit the publication of three heliotype plates illustrating his monograph on the cytology of Opalinid Ciliate Protozoa:

3. To W. W. Coblentz, U. S. Bureau of Standards, $400, for expenses in connection with an evaluation of ultra-violet in sunlight at Flagstaff, Arizona:

4. To E. A. Culler, University of Illinois, $350, for purchasing apparatus to be used in an investigation of the effect upon hearing of protracted exposure to sound-frequencies of high intensity:

5. To J. W. McBain, Stanford University, $400, for materials and equipment to aid him in determining absorption in the air-water interface:

6. To Charles Palache, Harvard University, $250, for the technical assistance of R. C. Wells in a study of the chemical composition of the mineral samarskite, especially with respect to its content of uranium, thorium, and lead, as a basis of the determination of geological age:

7. To Gayle Scott, Texas Christian University, $500, for field

expenses in a study of the stratigraphy and paleontology of the Trinity Group in Texas:

8. To A. F. Shull, University of Michigan, $300, for expenses in connection with an investigation of the internal and external factors influencing wing production in aphids.

The President announced the death of two Fellows:—Harold Murdock (Class IV, Section 4), and Henry Weeden Underwood, Jr. (Class I, Section 3); and one Foreign Honorary Member:—Francis Arthur Bather (Class II, Section 3).

The following communication was presented:

Mr. Bernard E. Proctor: "The Microbiology of the Upper Air," illustrated with lantern slides.

One paper was read by title: "The Wood-Feeding Roach Cryptocercus, its Protozoa, and the Symbiosis between Protozoa and Roach," by L. R. Cleveland.

The meeting was dissolved at 9.45 P. M.

One Thousand Two Hundred and Fifteenth Meeting.

MAY 9, 1934.—ANNUAL MEETING.

The Academy met at its House at 8.20 P. M.

The PRESIDENT in the Chair.

There were present fifty-four Fellows and three guests.

The records of the meeting of April 11 were read and approved.

The Corresponding Secretary reported that the President had appointed Sir Arthur Keith as the delegate of the Academy at the First International Congress of Anthropological and Ethnological Sciences to be held at London, beginning July 30, 1934.

He also announced the appointment by the President of a Committee on the Disposal of Extra Publications consisting of Messrs. A. C. Lane (Chairman), R. P. Bigelow, H. V. Neal, and Ingersoll Bowditch.

The President announced the death of two Fellows:—LeBaron Russell Briggs (Class IV, Section 4) and William Henry Welch (Class II, Section 4); and of one Foreign Honorary Member:—Archibald Byron Macallum (Class I, Section 3).

The following report of the Council was presented:

REPORT OF THE COUNCIL.

Since the last report of the Council there have been reported the deaths of fifteen Fellows:—Irving Babbitt, LeBaron Russell Briggs, John Candler Cobb, Arthur Powell Davis, William Morris Davis, Henry Walcott Farnam, James Arnold Lowell, Edward Furber Miller, Everett Morss, Harold Murdock, Lyman Churchill Newell, Arthur Kingsley Porter, John Eliot Thayer, Henry Weeden Underwood, Jr., William Henry Welch; and five Foreign Honorary Members:—Francis Arthur Bather, Robert Seymour Conway, Viktor Goldschmidt, Fritz Haber, Archibald Byron Macallum.

Seventy Fellows and sixteen Foreign Honorary Members were elected by the Council and announced to the Academy in May 1933.

The roll now includes 719 Fellows and 116 Foreign Honorary Members (not including those elected in May 1934).

The annual report of the Treasurer, Ingersoll Bowditch, was read, of which the following is an abstract:

General Fund.

Receipts.

Income on hand April 1, 1933. .		$2,279.92	
From Investments	$2,594.72		
From Assessments	5,910.00		
From Admissions	430.00		
From Interest on Deposits. . .	44.35		
From Rumford Fund Income. .	200.00	9,179.07	$11,458.99

Expenditures.

Expenses of Library	$2,042.00		
Treasurer's Expenses	1,028.29		
Books and Binding.	1,234.34		
General Expenses	899.83		
House Expenses	2,184.67		
President's Expenses	10.00		
Interest on Bonds bought. . .	67.58	$7,466.71	
Income transferred to Principal		350.00	$ 7,816.71

Publication Account.

Receipts.

Income on hand April 1, 1933.		$8,551.98	
From Income—Appleton Fund .	$1,094.19		
From Income—Centennial Fund.	1,813.24		
From Authors' Reprints . . .	219.00		
From Sale of Publications. . .	536.20	3,662.63	$12,214.61

Expenditures.

Publications.	$8,271.32		
Vault Rent—part.	10.00	$8,281.32	
Interest on Bonds bought. . .	34.86		
Income transferred to Principal .	117.00	151.86	$ 8,433.18

Rumford Fund

Receipts.

Income on hand April 1, 1933	$1,568.65	
From Investments	3,381.00	$ 4,949.65

Expenditures.

Purchase and Binding of Books .	$ 270.55		
Research	3,340.00		
Transferred to General Fund Income for care of books . . .	200.00		
United States Mint—medals . .	313.49		
Bigelow, Kennard & Co.—engraving medals	15.00	$4,139.04	
Interest on Bonds bought. . .	.33		
Income transferred to Principal .	170.00	170.33	$ 4,309.37

C. M. Warren Fund.

Receipts.

From Investments		$ 1,057.90

Expenditures.

Income overdrawn	$ 22.08		
Research	900.00		
Vault rent—part	3.00	$ 925.08	
Interest on Bonds bought	59.03		
Income transferred to Principal	52.50	111.53	$ 1,036.61

Francis Amory Fund.

Receipts.

Income on hand April 1, 1933	$ 639.28	
From Investments	2,707.13	$ 3,346.41

Expenditures.

Publishing Statement	$ 61.25	
Income transferred to Principal	1,973.58	
Interest on Bonds bought	199.51	
Premium on Bonds bought	238.10	$ 2,472.44

Permanent Science Fund.

Receipts.

Received for above fund	$ 5,800.00

Expenditures.

Income overdrawn	$ 225.00	
Grants from above fund	4,575.00	$ 4,800.00

The following reports were also presented:

Report of the Library Committee.

During the year 154 volumes and thirty-seven unbound numbers of periodicals have been borrowed by twelve Fellows and eighteen

libraries, and more have been consulted at the Academy. All books taken out have been returned or satisfactorily accounted for.

The number of volumes on the shelves at the time of the last report was 43,517. During the year 429 volumes were added, largely by binding serials, making the number now 43,946. This includes 45 purchased from the General Fund, 27 from the Rumford Fund, and 357 received by gift or exchange.

The following appropriations were placed at the disposal of the Librarian during the past year:

Balance from General Fund	$ 305.95
Balance from Rumford Fund	81.47
Appropriation from General Fund	3,400.00
Appropriation from Rumford Fund	350.00
Total	$4,137.42

The expenses charged to the library during the financial year ending March 31, 1934, were:

Salaries	$2,000.00
Binding:	
General Fund	631.20
Rumford Fund	67.25
Total	$ 698.45
Purchase of Books and Periodicals:	
General Fund	$ 603.14
Rumford Fund	203.30
Total	$ 806.44
Miscellaneous	42.00
Total	$3,546.89

There remained an unexpended balance of $590.53, as follows:

General Fund	$ 429.61
Rumford Fund	160.92
Total	$ 590.53

As usual, this balance will be carried over to next year. The balance is larger than usual because the 1934 subscriptions to German

periodicals were not paid until after the close of the fiscal year. But difficulties of exchange make the amount needed unusually uncertain. Mrs. M. F. Ball, assistant librarian, has continued to faithfully and efficiently perform her varied duties.

Respectfully submitted,

ALFRED C. LANE, *Librarian.*

May 9, 1934.

REPORT OF THE RUMFORD COMMITTEE.

The Rumford Committee held three meetings during the academic year April 1, 1933–March 31, 1934, on April 12, May 10, and November 8, 1933.

The Committee made the following grants, during the year, from the Rumford Fund in aid of researches in light and heat:

1933	*No.*		*Amount*
Apr. 12	305	Prof. J. C. Stearns, Denver University, for equipment in continuation of cosmic researches	$ 300
Apr. 12	306	Prof. G. W. Kenrick, Tufts College, toward equipment in extension and continuation of his researches on the effects of solar radiation on the ionised layers	500
May 10	307	Prof. W. J. Luyten, University of Minnesota, for equipment in astrophotometric research	50
Nov. 8	308	Prof. N. A. Kent, Boston University, for equipment for luminous wave length researches	250
Nov. 8	309	Dr. C. E. Teeter, Jr., 109 Maple St., Waverly, Mass. for equipment for research on thermal properties of gases	250
Nov. 8	310	Dr. Jan Schilt, Columbia University, for photo-electric equipment for astronomical measurements	200
Nov. 8	311	Prof. Joel Stebbins, University of Wisconsin, for equipment in astronomical research	300
Nov. 8	312	Prof. G. R. Harrison, Mass. Institute of Tech., for equipment in spectroscopic research	400

1934	*No.*		*Amount*
Mar. 17	313	Prof. A. G. Worthing, University of Pittsburgh, for equipment in research on properties of matter at high temperatures . .	350
Total			$2,600

As stated in last year's report (May 1933), the Rumford Committee recommended to the Academy Council the award of the Rumford Medal to Prof. Harlow Shapley, Director of the Harvard Observatory, "for researches in the luminosities of stars and galaxies." The Medal was awarded at a joint meeting of the Academy with the American Association for the Advancement of Science (AAAS), in the Statler Hotel, on the evening of Saturday, December 30, 1933.

The following recent publications concerned researches that have been aided by Rumford grants:

"Magnetic Rotation Spectrum of the Red Bands of Sodium," by W. R. Fredrickson and C. R. Stannard. Grant No. 292. *Physical Review*, October 15, 1933, pp. 632–637.

"The Compressibility of Eighteen Cubic Compounds," by P. W. Bridgman. Grant No. 293. *Proc. Am. Acad. of Arts & Sciences*, Vol. 67, No. 9, December 1932.

"Compressibilities and Pressure Coefficients of Resistance of Elements, Compounds, and Alloys, Many of Them Anomalous," by P. W. Bridgman. Grant No. 293. *Proc. Am. Acad. of Arts & Sciences*, Vol. 68, No. 2, March 1933.

"The Pressure-Volume-Temperature Relations of Fifteen Liquids," by P. W. Bridgman. Grant No. 293. *Proc. Am. Acad. of Arts & Sciences*, Vol. 68, No. 1, March 1933.

Respectfully submitted,

A. E. KENNELLY, *Chairman.*

May 9, 1934.

REPORT OF THE C. M. WARREN COMMITTEE.

The Committee had at its disposal at the beginning of the fiscal year 1933–1934, $934.37, of which $903 has been appropriated during the past year, leaving a balance of $31.37.

Since the last annual report grants have been made as follows:

June 2, 1933: To Professor Henry F. Gilman, Iowa State University, $300, for the purchase of special chemicals to be used in the study of the relative reactivities of organo-metallic compounds.

June 2, 1933: To Professor Paul L. Kirk, Medical School, University of California, $260, for the purchase of the equipment of a petrographical microscope to be used in the determination of crystallographic and optical constants of amino acid derivatives.

June 30, 1933: To Professor Richard C. Tolman, California Institute of Technology, $440, to pay for the services of an assistant in the study of the homogeneous bimolecular reaction between acetyl chloride and methyl alcohol in the gas phase and in solution.

Reports of progress, during the current year, have been received from C. F. H. Allen, William Lloyd Evans, Henry F. Gilman, Ernest H. Huntress, C. R. Johnson, G. B. Kistiakowsky, Nelson K. Richtmyer, Hermann Schmid, and Evald Skau.

Six applications for grants totaling $1,900 are before the Committee for consideration at its next meeting.

The papers listed below, which have been published since the last report of the Committee, describe the results of investigations aided by the Warren Fund. In each case there is an acknowledgment by the author of the assistance received.

C. F. H. Allen and E. W. Spanagel:

"The Reactions of Anhydracetonebenzil. II." J. Am. Chem. Soc., **55**, 3773 (1933).

C. F. H. Allen and H. W. J. Cressman:

"Addition Reactions of Vinyl Phenyl Ketone. III. Methyl Malonate." J. Am. Chem. Soc., **55**, 2953 (1933).

Gale Francis Nadeau, Mildred Ratliff Newlin, and William Lloyd Evans:

"The Mechanism of Carbohydrate Oxidation, XVI. The Action of Aqueous Solutions of Potassium Hydroxide on l-Rhamnose." J. Am. Chem. Soc., **55**, 4957 (1933).

Nelson K. Richtmyer:

"The Cleavage of Glycosides by Catalytic Hydrogenation" (Title of paper presented by Professor Richtmyer before the Organic Division of the American Chemical Society at St. Petersburg. Additional experiments have been performed and the completed work is to be prepared for publication very soon.)

Herren H. Schmid and E. Gastinger-Wien:

"Spektralphotometrie Kurzlebiger Zwischenprodukte." Ztschr. Elektrochem. Bd. **39,** 573, Nr. 7b. (1933).

Greenstein, Jesse P. (Grant to Carl L. A. Schmidt):

"III. The Apparent Dissociation Constants, Free Energy Changes, and Heats of Ionization of Peptides Involving Arginine, Histidine, Lysine, Tyrosine, and Aspartic and Glutamic Acids, and the Behavior of Lysine Peptides toward Nitrous Acid." Journal of Biological Chemistry, **101,** (3), August, 1933.

Evald L. Skau:

"The Purification and Physical Properties of Organic Compounds. II." The Journal of Physical Chemistry, **37,** (5), May, 1933.

Evald L. Skau and Wendell H. Langdon:

"The Purification and Physical Properties of Chemical Compounds. IV." Proceedings of the National Academy of Sciences, **19,** (11), 943–947, November, 1933.

Evald L. Skau and I. Laird Newell:

"A Rapid Volumetric Method for Determination of Sulfur in Coal and Coke." Industrial and Engineering Chemistry, **5,** 180, May 15, 1933.

JAMES F. NORRIS, *Chairman.*

May 9, 1934.

REPORT OF THE COMMITTEE OF PUBLICATION.

During the year three meetings of the Committee of Publication have been held. At its meeting of December 6 the committee approved the suggestion of Dr. E. B. Wilson that subscribers to the publications of the Academy be granted the privilege of buying at reduced cost a duplicate set of the publications. At the meeting of March 14 the committee voted to let the contract for printing and binding the Cleveland memoir (Vol. 17, Part 2) to the George Banta Publishing Company, whose bid was the lowest received. As usual, for financial reasons, the committee has been obliged to decline for publication manuscripts by non-members.

Since the last report of the committee fifteen numbers of the Proceedings have been printed and distributed. These include numbers 6 to 13 of Volume 68 and 1 to 7 of Volume 69. In accordance with the recommendation of the Council, the Records number of the Proceed-

ings has been mailed to all members. The Cleveland memoir and the first fascicle of Professor Lake's Corpus of Dated Greek Minuscule Manuscripts will be off the press this month.

The financial report is as follows:

Receipts.

Balance April 1, 1933	$ 8,302.09
Balance Rumford Fund Account	249.89
Appropriation for 1933–34	2,223.00
Receipts from sales and reprints	755.20
Total available for publication 1933–34	$11,530.18

Expenses.

Printing, Engraving and Binding	$ 7,780.05
Mailing and cartage	491.27
Rental safety deposit box	10.00
Total	$ 8,281.32
Balance carried over to 1934–35	$ 3,248.86

The Committee of Publication wishes to express to the Committee on the Permanent Science Fund appreciation of its generous appropriation of $500 towards the expense of the Cleveland memoir. Grateful acknowledgment is also made of the gift of $2,000 contributed by the American Council of Learned Societies towards the cost of publication of the Corpus of Dated Greek Minuscule Manuscripts edited by Professor Kirsopp Lake and Mrs. Silva Lake.

Respectfully submitted,

H. V. NEAL, *Chairman.*

May 9, 1934.

REPORT OF THE HOUSE COMMITTEE.

The House Committee has had funds at its disposal amounting to $3,096.57, made up as follows:

Balance from previous year	$ 406.57
Appropriations for 1933–34	2,500.00
Received for use of rooms	190.00
Total	$3,096.57

Of this amount the sum of $2,272.50 has been spent for the routine expenses,—janitor, light, power, heat, telephone, etc., and $102.17 has been spent for upkeep and equipment; making a total of $2,374.67, and leaving an unexpended balance of $721.90.

Meetings have been held as follows:

The Academy	8
American Antiquarian Society	1
American Chemical Society, Northeastern Section	8
Archæological Institute of America, Boston Society	3
Japan Society of Boston	3
Mediæval Academy of America	1
New England Botanical Club	9
Total	33

The Council Chamber has been used for Academy Council and Committee meetings, and also by the Trustees of the Children's Museum, the New England Farm and Garden Association, etc.

A detailed list of expenditures follows:

Janitor	$ 968.00
Electricity: Light	260.25
Power.	70.44
Fuel.	616.17
Elevator	99.05
Gas	68.10
Telephone	112.02
Water	51.52
Ash tickets	14.85
Upkeep	100.37
Furnishing and equipment	1.80
Janitor's supplies and sundries	12.10
Total	$2,374.67

Respectfully submitted,
S. Burt Wolbach, *Chairman.*

May 9, 1934.

On motion of Mr. E. A. Whitman, seconded by Mr. A. C. Lane, it was *Voted*, To refer to the House Committee the getting of an estimate

for improvement of the acoustics and ventilation of the Lecture Hall of the Academy.

On the recommendation of the Treasurer, it was *Voted*, That the annual assessment for the ensuing year be $10.00.

The annual election resulted in the choice of the following officers and committees:

GEORGE HOWARD PARKER, *President*
JAMES FLACK NORRIS, *Vice-President for Class I*
WALTER BRADFORD CANNON, *Vice-President for Class II*
EDWIN FRANCIS GAY, *Vice-President for Class III*
ARTHUR STANLEY PEASE, *Vice-President for Class IV*
TENNEY LOMBARD DAVIS, *Corresponding Secretary*
WALTER EUGENE CLARK, *Recording Secretary*
INGERSOLL BOWDITCH, *Treasurer*
ALFRED CHURCH LANE, *Librarian*
ROBERT PAYNE BIGELOW, *Editor*

Councillors for Four Years.

WILLIAM C. GRAUSTEIN, of Class I — JOSEPH H. BEALE, of Class III
KIRK BRYAN, of Class II — EDGAR S. BRIGHTMAN, of Class IV

Finance Committee.

THOMAS BARBOUR — PAUL J. SACHS — ALFRED L. RIPLEY

Rumford Committee.

ARTHUR E. KENNELLY

ELIHU THOMSON — HARRY M. GOODWIN — HARLOW SHAPLEY
PERCY W. BRIDGMAN — CHARLES L. NORTON — NORTON A. KENT

C. M. Warren Committee.

JAMES F. NORRIS

GREGORY P. BAXTER — ARTHUR D. LITTLE — REID HUNT
WALTER L. JENNINGS — FREDERICK G. KEYES — CHARLES A. KRAUS

Committee of Publication.

ROBERT P. BIGELOW, *Chairman*

EDWIN C. KEMBLE, of Class I — JOSEPH H. BEALE, of Class III
FREDERIC T. LEWIS, of Class II — ROBERT P. BLAKE, of Class IV

Committee on the Library.

ALFRED C. LANE, *Chairman*

RAYMOND C. ARCHIBALD, of Class I NATHAN ISAACS, of Class III
THOMAS BARBOUR, of Class II HENRY B. WASHBURN, of Class IV

Auditing Committee.

GEORGE R. AGASSIZ ALEXANDER FORBES

House Committee.

S. BURT WOLBACH, *Chairman*

WILLIAM H. LAWRENCE ROBERT P. BIGELOW DAVIS R. DEWEY

Committee on Biographical Notices.

DAVIS R. DEWEY, *Chairman*

JAMES F. NORRIS JOSEPH H. BEALE
ALFRED C. Lane WALTER E. CLARK SAMUEL E. MORISON

Committee on Meetings.

THE PRESIDENT
THE RECORDING SECRETARY

DANIEL F. COMSTOCK LEIGH HOADLEY CHARLES J. BULLOCK
JOSHUA WHATMOUGH

The Corresponding Secretary announced that the following had been elected members of the Academy:

FELLOWS.

CLASS I.

Section 1. Griffith Conrad Evans, Houston, Texas
Donald Howard Menzel, Cambridge

Section 2. Franzo Hazlett Crawford, Cambridge
Louis Williams McKeehan, New Haven, Conn.
Harry Rose Mimno, Cambridge
Philip McCord Morse, Cambridge
Leigh Page, New Haven, Conn.
John Hasbrouck Van Vleck, Madison, Wis.

Section 3. Leighton Bruerton Smith, Beverly
David Elbridge Worrall, Tufts College
Section 4. Otto Gustav Colbiornsen Dahl, Brookline
Chester Laurens Dawes, Cambridge
Jacob Pieter Den Hartog, Wellesley Hills
Jerome Clark Hunsaker, Cambridge
Edward Leyburn Moreland, Wellesley

CLASS II.

Section 1. Sterling Price Fergusson, Milton
Walter Harry Newhouse, Cambridge
Carl-Gustaf Arvid Rossby, Hingham
Section 2. Edgar Anderson, Jamaica Plain
Donald Forsha Jones, New Haven, Conn.
Edmund Ware Sinnott, New York, N. Y.
Gilbert Morgan Smith, Stanford University, Cal.
Section 3. Cyrus Hartwell Fiske, Belmont
John Farquhar Fulton, New Haven, Conn.
Hudson Hoagland, Worcester
Alfred Newton Richards, Philadelphia, Pa.
Oscar Riddle, Cold Spring Harbor, N. Y.
Section 4. Henry Jackson, Jr., Chestnut Hill
Leroy Matthew Simpson Miner, Newtonville
William Carter Quinby, Brookline
Arthur Hiler Ruggles, Providence, R. I.

Class III.

Section 2. Edgar Stephenson Furniss, New Haven, Conn.
Alfred Emanuel Smith, New York, N. Y.
Section 3. John Maurice Clark, New York, N. Y.
Winthrop More Daniels, New Haven, Conn.
John Franklin Ebersole, Belmont
Ralph Evans Freeman, Cambridge
Robert Murray Haig, New York, N. Y.
Albert Galloway Keller, New Haven, Conn.
Edwin Walter Kemmerer, Princeton, N. J.
Frank Hyneman Knight, Chicago, Ill.
Robert Morison MacIver, New York, N. Y.

Richard Stockton Meriam, South Lincoln
Harry Alvin Millis, Chicago, Ill.
Arthur Eli Monroe, Cambridge
Edwin Griswold Nourse, Washington, D. C.
Sumner Huber Schlichter, Cambridge
Frederick John Teggart, Berkeley, Cal.
Jacob Viner, Chicago, Ill.
Leo Wolman, Washington, D. C.
Carle Clark Zimmerman, Winchester

Section 4. Matt Bushnell Jones, Newton Center
Henry Plimpton Kendall, Walpole
Clarence Cook Little, Bar Harbor, Maine
Erwin Haskell Schell, Cambridge
Charles Franklin Thwing, Cleveland, Ohio

CLASS IV.

Section 1. Kurt Koffka, Northampton
Lewis Madison Terman, Stanford University, Cal.
Edward Lee Thorndike, New York, N. Y.

Section 2. Clarence Gordon Campbell, New York, N. Y.
Robert Henry Pfeiffer, Cambridge
David Moore Robinson, Baltimore, Md.
Theodore Leslie Shear, Princeton, N. J.
Lawrence Counselman Wroth, Providence, R. I.

Section 3. Austin Morris Harmon, New Haven, Conn.
Roland Grubb Kent, Philadelphia, Pa.
William Abbott Oldfather, Urbana, Ill.

Section 4. Charles Jay Connick, Newtonville
Samuel Foster Damon, Providence, R. I.
Eugene Edward Speicher, New York, N. Y.

FOREIGN HONORARY MEMBERS.

CLASS I.

Section 1. Ronald Aylmer Fisher, London

Section 3. Richard Willstätter, Munich

Section 4. Paul Janet, Paris
Luigi Lombardi, Rome

CLASS II.

Section 1. Arthur Holmes, Durham
Section 3. Archibald Vivian Hill, London

CLASS III.

Section 3. Gustav Cassel, Stockholm
Peter B. Struve, Belgrade

CLASS IV.

Section 4. Serge Koussevitzky, Paris

The following communication was presented:

Mr. Abbott Payson Usher: "Social Evolution and Historical Process," illustrated with lantern slides.

One paper was read by title: "Magnetic Formulas Expressed in the M. K. S. System of Units," by A. E. Kennelly.

The meeting was dissolved at ten P. M.

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IRVING BABBITT (1865–1933).

Fellow in Class IV, Section 4, 1921.

Irving Babbitt, who died in Cambridge on July 5, 1933, was essentially a crusader. Early convinced that it was his duty to combat pernicious error and ignorance, he made it his life work to maintain, with all the resources of learning, eloquence, and wit, the staid doctrine of Humanism, as opposed to purposeless Flux and Naturalism. Thus he became the acknowledged champion of the Humanists in this country, highly appreciated both here and abroad. For a long while he had as a fellow-worker Paul Elmer Moore, once his companion in graduate work. In the opinion of the Humanist school, America (as, indeed, the whole world) suffers from absence of real criticism, due to the lack of permanent standards. Such standards, and the criticism that depends on them, Babbitt strove with all his might and main to inculcate. During his career he was led to oppose violently the philosophical tenets most in vogue—Pragmatism, Bergsonism and the school of John Dewey. Always a formidable antagonist, he aroused much opposition while making, especially among younger men, a considerable number of disciples. Never deterred, he pursued his relentless course unfalteringly, forcefully, patiently carrying on the long tradition of Humanism, by which he meant the doctrine of the distinct and unique position of man in the universe—man, in whom the material and the spiritual meet; man, responsible to a law superior to himself, which we can and must discover by means of our higher imagination. Not a reactionary (though often so described) he recognized the necessity of constant change, but he saw behind all changes certain unchanging principles which should guide us in our literary criticism and in all our philosophical thought. We have been caught, he believed, in the trap of Naturalism, which confuses the law of man and the law of things; from that fatal confusion it is the business of Humanism to extricate us. Against Romanticism, which substitutes caprice and unbridled sentimentalism for stable judgment, and against the great exponent of Romanticism, J. J. Rousseau, he waged ceaseless war. Never did he shrink from hostility to those, living or dead, whom he regarded as perniciously in the wrong. Therein may be found the answer to the question once asked by one of his intelligent students: "Why does Professor Babbitt

always give courses about people whom he hates?" For in his system it was necessary that blame should usually prevail over praise.

Babbitt was born in Dayton, Ohio, on August 2, 1865, obtained a Harvard A.B. in 1889, and then for a brief period taught Greek in Montana. After spending 1891 and 1892 in Paris in the study of Oriental languages, he received in 1893 a Harvard A.M. Later, in 1912, Bowdoin gave him the honorary degree of L.H.D. A short term in Williams as instructor in Romance Languages in 1893–94 was followed, in 1894, by an instructorship in French at Harvard; in 1902 he became assistant professor of French and in 1912 he was promoted to a full professorship in French Literature. Although he continued until the end to belong to the Romance Department, the most important part of his work was in Comparative Literature. In considerable demand at other institutions, he gave lectures at Kenyon College, at Yale, at North Carolina, at Amherst, at Toronto, at Stanford University. In 1923 he was Harvard Exchange Professor in Paris. He was a Fellow of the American Academy of Arts and Sciences and of the American Academy of Arts and Letters, an honorary member of the Phi Beta Kappa, and a *corréspondant* of the Institut de France. Between 1898 and 1910 he edited works of Taine, Renan, Voltaire, and Racine. The first of his own writings to appear was *Literature and the American College*, 1908. Then came, from 1910 to 1929, *The New Laokoön*, *The Masters of Modern French Criticism*, *Rousseau and Romanticism*, *Democracy and Leadership*.

C. H. Grandgent.

BERNARD ARTHUR BEHREND (1875–1932).

Fellow in Class I, Section 4, 1917.[1]

In the death of Dr. B. A. Behrend on March 25, 1932, the Academy lost a distinguished member who was actively associated with electrical engineering for over three decades. Had the art lacked boldness and originality such as characterized his contributions to the design of electric machinery during this period, it is no exaggeration to say that the industry would have been retarded in reaching its present

[1] For data regarding Dr. Behrend's life and personality the writer is indebted to the kind suggestions of Mrs. Behrend and Mrs. Katharine Maynard, in addition to knowledge derived from personal acquaintance.

development. Thus electrical engineering owes a debt to Dr. Behrend for his conspicuous part in maintaining initiative and originality in the field. Ideas and concepts which he brought forward as a young man became guiding principles of succeeding designers, and many of his proposals which at first were rejected as "radical" or "revolutionary" were ultimately adopted as standard thought and practice.

Dr. Behrend was born at Villeneuve, Switzerland, on May 9, 1875, the youngest son among many children. His family was long identified with the paper business, including the Hammermill Paper Company in Germany and in Erie, Pa., but the youngest Behrend from his earliest years was interested in the science of electricity.

Because of his precocity his education was for the most part self-directed and informal. After his first early training under an English tutor he attended educational institutions in Germany, France, and England as a special student, following his natural bent, and studying at will under chosen leaders of scientific thought. Among these were Helmholtz and Kundt of the University of Berlin and Riedler, Slaby, and Kapp of the Technische Hochschule. Darmstadt gave him the honorary degree of Doctor of Engineering in 1931.

Early professional experience was acquired with the Oerlikon Company in Switzerland, and with Gisbert Kapp with whom he lived and worked in England. He was on terms of easy intimacy with the families of Huxley and Sir Oliver Lodge, and developed a strong *anglophile* tendency. Coming to America in 1898, however, he applied for citizenship, and to the end of his life his best energies were devoted to the development of electrical engineering in this country.

Before forming permanent business connections here, Behrend in 1899 gave a series of lectures on alternating-current design at the University of Wisconsin at the invitation of the writer of this memoir, and the material of those lectures formed the basis of his well-known book, "The Induction Motor, its Theory and Design," published in 1901. He joined the staff of the Bullock Electrical Manufacturing Company in 1900, became chief engineer, and built their first turbo-alternator, which won a grand prize at the Louisiana Purchase Exposition in 1904 and brought its designer a gold medal. The largest power unit of the exposition, a 96-pole, 3500 kw. alternator, was also designed by him, and, because of its dependability in that uncertain day, came to be known as "Old Reliable."

With the consolidation of the Bullock Company with the Allis-Chalmers Manufacturing Company, Dr. Behrend became head of their combined electrical departments, and in that post directed the designing and construction of many large alternating-current generators, some of which were driven by hydraulic turbines and some by steam turbines, and a notable proportion of which possessed record-making qualities. He also designed large gas-engine-driven sets for several steel companies.

In 1908 the Westinghouse Electric and Manufacturing Company invited him to organize a similar department at East Pittsburgh and this he successfully accomplished. On account of the unfavorable climate he spent only two years in Pittsburgh, but continued to advise the company after he had opened offices as a consulting engineer in Boston.

The following are some of Dr. Behrend's more important engineering achievements: In the summer of 1895, when twenty years old, he demonstrated the circle diagram for the induction motor, publishing his proof in January 1896 after actual trials had verified its soundness; he developed a successful theory of regulation of alternators under inductive loads; designed the radial-slot rotor for turbo-generators, with chrome nickel end rings; with Ralph D. Mershon he brought about the first successful large-station inter-connection between Lachine Rapids and Shawinigan Falls; he employed very light fly-wheels for the first time in the parallel operation of large gas-engine-driven alternators; and developed the plate rotor construction still used by the Westinghouse Company for its largest turbine-driven machines. He was granted over 80 patents, most of which were assigned to the companies which he represented. In 1912, for improvements in high-speed electric generators, he was given the John Scott medal of the Franklin Institute.

During all these years of active engineering practice he pursued as a personal hobby the making of fine instruments for precision measurements. Although many of these—developed wholly at his own expense—were later adopted as standard articles of production, he was satisfied to have perfected a needed tool for his own experiments, and made no claim for compensation from the manufacturers.

Other hobbies which engrossed his attention were book-collecting and studies of early American furniture and American Colonial

architecture. Of books he bought widely in the field of Americana and *belles-lettres* as well as in science, and at one time owned what was reputed to be the finest collection of Thackeray in America, which Lady Ritchie helped him to assemble. He built a notable example of English domestic architecture in Brookline, and restored with great fidelity an early American house in Longwood.

Dr. Behrend was a fellow of the American Institute of Electrical Engineers; the American Association for the Advancement of Science; the American Physical Society; the American Academy of Arts and Sciences; and a member of the American Society of Civil Engineers; the American Society of Mechanical Engineers; the Institution of Electrical Engineers (Great Britain); the Franklin Institute; and the Society for the Preservation of New England Antiquities.

Numerous important technical papers witness to the activity of his mind and the value of his many inventions. In 1921 he brought out a second edition of his book under the enlarged title, "The Induction Motor and other Alternating Current Motors," dedicating it "To the great pioneers who have been my friends, Nikola Tesla, Gisbert Kapp, André Blondel, C. E. L. Brown."

This note of strong personal attachment was characteristic of the man. Of retiring disposition and frail health, he was little known to the general public, but to his intimates he was a cherished companion of rare mental vigor and keen humor. Ever inclined to take the part of the individual against the group, it was natural that he should defend with warmth the claims of Oliver Heaviside to wider recognition. As senior vice-president of the American Institute of Electrical Engineers he was instrumental in having its honorary membership conferred upon Heaviside, and used his good offices in persuading Heaviside to accept it. A portion of Heaviside's library, bought by Dr. Behrend in the settlement of the estate, has recently been on exhibition at the Massachusetts Institute of Technology.

Among the scientists Thomas Henry Huxley was his revered mental master, and the portrait of Huxley now hanging in our Academy lecture room was executed for Dr. Behrend by the Honorable John Collier, and presented to the Academy in 1930. This is a replica of the portrait painted for Mr. Henry Huxley, and of which an additional replica hangs in the National Portrait Gallery in London.

In 1926 Dr. Behrend married Miss Margaret P. Chase, whose

devotion lightened the increasing burden of ill-health in his later years. His last residence in Wellesley Hills, designed largely by himself, became a center of true hospitality and philosophic discussion. It contained a working laboratory and half a mile of book shelves, thereby reflecting the personality of its owner, who was a man of discriminating taste as well as a scientist, scholar and engineer. He had a notable philosophical cast of mind and a characteristic wit which made him a stimulating companion for all who truly cultivated his acquaintance.

DUGALD C. JACKSON.

Selected Titles from among the Writings of

Dr. B. A. Behrend.

1900 On the mechanical forces in dynamos caused by magnetic attraction. A. I. E. E. Trans. **17**: 617–26 (Discussion 627–33), 1900.

The factors which determine the design of monophase and polyphase generators. El. World and Engr. **35**: 90–92, 125–27, 166–68, Jan. 20–Feb. 3, 1900.

The Induction motor. El. World and Engr. **36**: 676 ff. Nov. 3–Dec. 29, 1900. (A Series of articles forming the basis of the book published in 1901.)

1901 The induction motor. A short treatise on its theory and design, with numerous experimental data and diagrams. N. Y., Electrical World and Engineer, 1901. 105 p.

1903 The experimental basis for the theory of the regulation of alternators. A. I. E. E. Trans. **21**: 497–517, 1903.

An improved method of testing large alternators under full load conditions. El. World and Engr. **42**: 715–16, 802–03, Oct. 31, Nov. 14, 1903.

1907 Introduction to discussion on the practicability of large generators wound for 22,000 volts. A. I. E. E. Trans. **26**: 351–56 (Discussion 357–95), 1907.

1908 A new large generator for Niagara Falls. A. I. E. E. Trans. **27**: 1057–68, 1908.

1921 The induction motor and other alternating current motors: their theory and principles of design. Second edition. N. Y.: McGraw-Hill, 1921. 23–272 p.

CHARLES FRANCIS BRUSH (1849–1929).

Fellow in Class I, Section 4, 1917.

The first time I saw Mr. Charles F. Brush was at the International Electrical Exhibition held in Philadelphia in the autumn of 1884. The Brush Electric Company which he had founded in Cleveland, Ohio, for the development, manufacture, and sale of electrical machinery and other equipment was one of the exhibitors in the Exhibition, and Mr. Brush appeared before my college-student eyes as a member of an exhibitor group comprising Edison, Elihu Thomson, Edward Weston, Frank Sprague, Vandepoele, William Stanley, and others who likewise were associated with exhibits in that Exhibition. Brush had invented the differential arc-lamp six years earlier and thereby made feasible the simultaneous operation of many arc-lamps fed in a series on one electrical circuit from the generator. He also had invented electric generators and motors, lead-cell storage batteries, and other electrical devices. He was rather tall, rather spare, rather serious in mien. Compared with Thomson, Weston, Sprague, Vandepoele, and even with Edison, whose personal exhibit was under the direction of William J. Hammer, Brush gave little attention to his exhibit in this pioneer American electrical exhibition. He apparently found that his workshop in Cleveland contained interests more to his tastes than intimate association with his fellow inventor-exhibitors and contact with the flocking exhibition visitors. Nevertheless, Mr. Brush was a man of friendly and hospitable instincts and he practiced at his home a quiet hospitality that was appreciated in Cleveland.

Born in Euclid township, Cuyahoga County, Ohio, on March 17th, 1849, he was the son of an early manufacturer of woolen products who had moved to Ohio to engage in farming. The boy early became enflamed with an interest in electrical devices and is said to have planned at the age of 15 an electrical arrangement for turning gas street-lamps on and off in groups. In any event, his graduating essay at the Cleveland High School in 1865 was on dynamos and arc lights, regarding which some information had come to this country as news of Mr. Wilde's experiments in England. In those days there was no such rich range of choice among engineering curricula in the colleges as is now available to young high-school graduates. Indeed, but few curricula of engineering of any kind then existed in the colleges. The

University of Michigan offered the opportunity of engineering study and Mr. Brush graduated from that University as a mining engineer in 1869. From this start it was natural for his earliest employment to be in work as a chemical expert and from that to drift into the business of merchant for metals and ores.

However, the lure of electrical machinery maintained its hold and by 1876 he was designing and supervising the construction of a dynamo. In 1877 he retired from other employment in order that he might devote himself wholly to investigation and experimentation related to possibilities for producing light by means of the electric current. His progress was rapid. One of the earliest Brush arc-light dynamos was exhibited operating arc-lamps at the Charitable Mechanics' Fair in Boston in 1878. A dynamo along with perhaps one or two arc-lamps was shown and tested at the Franklin Institute in Philadelphia a year or so earlier. The differential arc-lamp and the disc clutch had been invented in the interval and arc-lighting had been established on a practicable basis. The Brush arc-light system was adopted for street lighting by the City of Cleveland in 1878 and was soon recognized and used all over the world. The Brush Electric Company was incorporated and established in Cleveland in 1881. An associated British company in that year exhibited the Brush dynamo and arc-lighting system at the International Electrical Exposition in Paris (France) and this brought to Mr. Brush the decoration of Chevalier in the Legion of Honor.

Mr. Brush was prolific in inventions for many years, some of them being improvements for his arc-lighting system, like the double arc-lamp for all night burning with an automatic cutover from one pair of electrodes to the other; the automatic cutout for each lamp, which operated to by-pass the lamp and avoid disturbing the main circuit in case the carbon electrodes of the lamp became exhausted or some defect in the operating mechanism arose; means for charging storage batteries from the constant-current arc-light system, and so on. Additional inventions were in connection with electroplating, electric storage batteries, the copper plating of carbon electrodes intended for use in arc lamps, various aspects of the construction of dynamos, compound winding of dynamos, and other features pertaining to the field of electrical engineering or collateral thereto. He was naturally a good mechanic and he liked to aid in the work of constructing

experimental machines. One of the earliest examples of Brush compounded electrical generators is now deposited by the writer as a loan in the Ford historical museum at Dearborn, Michigan. The windings of this small machine are reputed to have been put on it by Brush personally. The boldness and originality of Mr. Brush's inventions in the field are illustrated by the fact that various of his patents covered devices which were much coveted for commercial use by competitors and this resulted in considerable litigation over the validity of the patents. It is said that the definitive patents on the double arc-lamp were so frequently in litigation that they were upheld in sixteen different Court decisions. His adequate (as well as early) recognition of the possibility of making the arc-lamp a desirable illuminant for commercial application, his originality in experiment and invention, his capability as a constructor and a business man quickly gave his arc-lighting system a tremendous vogue, and it developed a wide use at a time when it was substantially without electrical competitors. This justly entitles Brush to his often expressed name of Father of Commercial Arc Lighting.

About 1892 the General Electric Company (which then recently had been formed by consolidation) absorbed the Brush Electric Company and Mr. Brush turned to other fields. He was the founder and first president of the Linde Air Products Company which was established in this country; he was president of the Cleveland Arcade Company; and as one of the first citizens of Cleveland he served his community in many capacities. He was a warden of Trinity Cathedral; a member of the Corporation of Case School of Applied Science; a trustee of Western Reserve University, Adelbert College, University School, Cleveland School of Art, and Lake View Cemetery; and member of the Sinking Fund Commission of Cleveland. He was a member of the Cleveland Chamber of Commerce, of which he was president for the two years, 1909–10, and also was active in the Ohio State Board of Commerce and the Chamber of Commerce of the United States. He was at one time president of the Euclid Avenue National Bank in Cleveland.

His professional interests led him into membership in many societies including the American Society of Mechanical Engineers, the American Chemical Society, the American Institute of Mining and Metallurgical Engineers, The Franklin Institute, the Illuminating Engineering

Society, the Archeological Institute of America, the American Historical Association, the American Association for the Advancement of Science (Fellow), the American Physical Society (Fellow), the American Geographical Society (Fellow), the Royal Society of Arts, the British Association for the Advancement of Science, and the North British Academy of Arts (Fellow). He was a charter member of the American Institute of Electrical Engineers, served on its first Board of Directors and was its Edison Medalist of 1913. He was an Honorary Member of the American Society for Steel Treating. He became a Fellow of this American Academy of Arts and Sciences in 1917.

His achievements in the practical development of electric arc-lighting brought him the Rumford Medal of this Academy in 1899, the Edison Medal of the American Institute of Electrical Engineers in 1913 and the Franklin Medal of the Franklin Institute in 1928. University honors were generously accorded him. Western Reserve University conferred on him the degree of Ph.D. in 1880 and LL.D. in 1900. The University of Michigan gave him an M.S. in 1899 and an Sc.D. in 1912. Kenyon College bestowed an LL.D. in 1903.

A large part of his life was lived in his house on Euclid Avenue in Cleveland, which house was built about 1880. In its basement he maintained a well-equipped laboratory and machine shop. It was here that many experimental machines were constructed and his experiments were later carried out in the field of gravitation which, along with "A Kinetic Theory of Gravitation," are described in a series of papers published in the Proceedings of the American Philosophical Society from 1917 to 1928 in succession to earlier communications to *Nature* and *Science*.

Mr. Brush was married to Mary E. Morris of Cleveland in 1875. She bore him a son and two daughters. On his death in 1929 he also had four living grandchildren. On Sunday nights such members of his family as were available dined with him in happy informality and personal intimacy. It was on these occasions that, with his active mind and his intimate association with his children and grandchildren, Mr. Brush seemed to throw off his years and live as one of the younger generation. His wife died many years ago. His son, Charles F. Brush, Jr., was a young man of vigor and intellect who gave promise of large achievements. The tragedy of his death in 1927 was a heavy

blow to the father with whom the young man was on terms of fine intimacy. Mr. Brush established the Charles F. Brush Foundation for the Betterment of the Human Race to which he gave a capital of $500,000 placed in trust to the memory of his son. Several pamphlet publications of interest have come from this Foundation.

Mr. Brush was stricken with pneumonia in his eightieth year and died at his home in Cleveland on June 15, 1929. He has left to us the memory of a distinguished name for pioneer investigation and invention in the field of applied electricity of which the influences still strongly persist; and to Cleveland the memory of a citizen who lived a life of long-continued service to the community after having (through his bold originality) established a new and important industry within the city.

DUGALD C. JACKSON.

JOHN MASON CLARKE (1857–1925).

Fellow in Class II, Section 1, 1915.

John Mason Clarke, was born at Canandaigua, New York, on April 15, 1857, and died at Albany, New York, May 29, 1925.

He received his early education at the Canandaigua Academy, in which his father, Noah Turner Clarke, was for fifty years a teacher and for almost thirty years the principal.

He graduated from Amherst College in 1877, returning thence to Canandaigua, where he taught in the academy for a year, during which he began work on a detailed survey of the geology of the locality. The next year he was called to Amherst as a temporary assistant to Professor B. K. Emerson, to arrange large collections of minerals and shells in the Appleton Cabinet. In 1880 he taught science at the Utica Free Academy, a position in which two distinguished geologists, James D. Dana and G. H. Williams, had preceded him. Professor Emerson succeeded in having Clarke appointed Instructor in Geology, Mineralogy, and Zoölogy at Smith in 1881. Emerson had studied in Germany and it is probable that it was his example that led his protégé to obtain a leave of absence from this position and repair to Göttingen for study with von Koenen. He remained a little over a year, returning in the fall of 1884. He spent the next academic year teaching Geology, Zoology, and German at the Massachusetts

Agricultural College. In the spring of 1885 he returned to Canandaigua to resume the study of the local geology, add to his collection of fossils, and await a more satisfactory opening. This came, and he entered upon his real life work on January 1, 1886, when he became assistant to James Hall, New York State Geologist and Palaeontologist. Twelve years later, after Hall's death, he became State Palaeontologist, and in 1904, State Geologist and Palaeontologist, Director of the State Museum, and Director of Science in the New York State Education Department. All of these offices, as well as that of Professor of Geology and Mineralogy in the Rensselaer Polytechnic Institute at Troy, which he had assumed in 1894, he held until his death.

Clarke was predestined to be a palaeontologist. His home was surrounded with fossils which were the playthings of his childhood and the absorbing interest of his youth. His father had collected fossils for years, and early supplied books on geology to that one of his five children who showed an interest in this branch of natural science. He probably had very little formal training in palaeontology until his year with von Koenen at Göttingen, but, like most of the palaeontologists of his generation, learned from the fossils and the rocks rather than from books and teachers.

At Albany, however, he was plunged into very practical palaeontological work. At the time he joined the staff, James Hall was 75 years old, and was glad to transfer to younger men the task of actually describing the various species of fossils which occupied the pages of the later volumes of the monumental Palaeontology of New York. Volume VII, Crustacea, although published only two years after Clarke's arrival, was almost entirely his work, not only in execution but in plan. Although his first important publication, it shows no evidence of immaturity, and as Schuchert has said, Clarke does not appear to have gone through an apprenticeship, but to have suddenly come forth as a successful descriptive palaeontologist.

Volume VII finished, work was begun on the final volume of the series which appeared in two parts in 1892 and 1894. On the "Introduction to the study of the Genera of Palaeozoic Brachiopoda" Clarke had the assistance of Charles Schuchert for two and a half years, but the writing was done almost entirely by Clarke, under the supervision of Hall. So great a share did he have in the work that Hall deviated so far from his usual custom as to allow the words

"assisted by John M. Clarke" to appear below his own name on the title page, in only slightly smaller type. These volumes, with the "Handbook" which accompanied them, still remain the outstanding works on the morphology of Paleozoic Brachiopoda, and mark, at least in the writer's opinion, the highest point reached by Clarke as a palaeontologist.

Clarke's next important work, and the last as assistant to Hall, was the memoir on the Palaeozoic glass-sponges, issued in 1898, the year of Hall's death.

The period from 1898 to 1904 was for Clarke one of transition. His bibliography shows that he was exceedingly busy during this time on a variety of subjects. His attention was directed largely to the stratigraphic side of palaeontology. As a result there appeared in 1898 and 1904 his studies on the Naples Fauna in Western New York, a work of the utmost importance, treated in a masterly manner.

The Middle Upper Devonian strata had been thought to be nearly barren of organic remains, but Clarke not only found them, but showed their relationships to those of faunas of the same age in Europe. He also explained the stratigraphy of the beds containing them, especially as related to the unlike strata in the eastern part of the State.

The rearrangement which took place in Albany in 1904 brought Clarke for the first time into a position where he had freedom of action. As Director of Science in the New York State Education Department, he was in charge, not only of the State Geological Survey, but also of the State Museum and its several Departments. Highly successful as an executive, he brought the New York State Museum out of its stuffy, dismal old quarters, assembling on the upper floor of the Education Building one of the best museums in the country. Even the invertebrate fossils, usually the despair of the curator of a collection, yielded to his genius, and became an attractive as well as instructive part of the exhibit.

His efforts at public instruction were not confined to the Museum, however, for, realizing the importance of preserving localities of great geological interest, he succeeded in obtaining for the people no less than six reservations now under the administration of the New York State Museum, in themselves virtually out-of-door museums. Nor should it be forgotten that Clarke was very largely influential in the preservation of the scenic beauties of Niagara Falls.

A true palaeontologist, Clarke spent his vacations in the study of palaeontology as a relief from his regular work with fossils. But from the summer of 1900 onward, he shifted the scene of his vacation labors from New York to the peninsula of Gaspé, a land which fascinated him, as it does every lover of the beautiful and the ancient. Many results in the line of history, of folk lore, of old ceramics, of bird sanctuaries, and of fossils came from his wanderings among the cliffed mountains and spurred shores of that still too-little visited land. Two books, "The Heart of Gaspé" (1913), and "L'Ile Percée" (1923), interest the general reader, whereas the two memoirs of the New York State Museum, published in 1908 and 1909, descriptive of the geology and palaeontology of Gaspé and adjacent regions, evoked the admiration of his colleagues and brought him the Spindiaroff prize at the International Geological Congress of 1910.

Clarke was also interested in the Devonian of South America. Although he never visited that continent, he contributed far more than anyone else to present knowledge of its Devonian, particularly that of Brazil and the Falkland Islands. His volume, "Fosseis Devonianos do Paraná," (1913), summarizes the greater part of the work which has been done on the subject in South America. This was the last of Clarke's large undertakings in purely descriptive palaeontology.

The fruits of his pondering on history, philosophy, and fossils are included in his address as President of the Palaeontological Society of America in 1911 and of the Geological Society in 1916, his book "Organic Dependence and Disease" (1921), and a paper read before the American Philosophical Society in 1922. Although Clarke would have it appear that his philosophy was derived from his studies of fossils, it must be obvious to anyone who reads these works that the fossils really serve largely as the text which a man of wide human experience, knowledge of the world and of history, chooses as a basis in expounding his views of life. He stood stoutly for individualism and for the ultimately beneficial racial results of the struggle for existence.

To these later years belongs also Clarke's greatest achievement, his "James Hall, of Albany, geologist and paleontologist, 1811–1898" (1921).

Clarke will probably be remembered chiefly for his systematic

descriptions of fossils. He was in no sense a "species maker," although he is credited by Schuchert with being the author of 135 new genera and about 870 species.

John M. Clarke had a charming personality and was the center of the group and conversation wherever he found himself. Of medium height, always slim and distinguished-looking, immaculately dressed, he showed distinct aristocratic tendencies in his person which were also evidenced in his actions and writings. It was not at all an objectionable quality, but one which evoked admiration and respect.

A ready and delightful speaker, Clarke was always in demand at dinners. His graceful manner, witty talk, great fund of knowledge, and personal experiences in many lines made him a delightful companion anywhere. To this personality he owed his great success as administrator of the many offices of the Director of Science in the New York State Education Department.

A very full bibliography of Clarke's writings, compiled by his son, Noah T. Clarke, and Miss Clara Mae LeVene, is appended to Schuchert's "Memorial" in the Bulletin of the Geological Society of America, 1926, Vol. 37, No. 1, pp. 72.

PERCY E. RAYMOND.

HENRY WALCOTT FARNAM (1853–1933).

Fellow in Class III, Section 3, 1914.

In the death of Henry W. Farnam, on September 5, 1933, Yale and the nation suffered a great loss, in the fields of learning, good works, and good citizenship. For this man had been a loyal supporter of his *Alma Mater*, an inspiring teacher, a discriminating but generous giver, and a whole-hearted participant in official and unofficial labors concerning the public weal. All these good works he did because he was, in the high sense of the word, a good man, who fortunately had the wordly means to make his good will more effective. Wealth was, to him, not an escape from the day's work, but a release of his great working powers for the more concentrated and effective service of humanity. His father, Henry Farnam, was President of the Rock Island Railroad, a partner of Joseph E. Sheffield, founder of the Sheffield Scientific School of Yale. The son accepted life as a trust; and, though intense in his adherence for all truth, was tolerant, humorous, wise, and human.

Professor Farnam was born November 6, 1853. He studied in Germany and graduated from Hopkins Grammar School before entering Yale. He graduated from Yale in 1874 after taking many honors, both scholarly and social. He continued his studies at Yale—in Economics and Roman Law—receiving, in 1876, his M.A. degree. Then he went once more to Germany, pursuing his studies in the Universities of Berlin, Goettingen and Strassburg. From Strassburg, in 1878, he received the degree of R.P.D. *magna cum laude*. He returned to Yale as a teacher, serving first as a tutor in Latin, later as a Professor of Economics. He served also in the Graduate School and as a member of the governing board of the Sheffield Scientific School. He became Professor Emeritus in 1918, and five years later Yale bestowed on him the degree of LL.D.

He took over the old *New Englander and Yale Review*, subsidizing it and changing its name to *Yale Review*. He made it largely an economic journal until the American Economic Association set up its *American Economic Review*, after which the *Yale Review* became a general magazine.

From 1910 to 1911 he was President of the American Economic Association.

In 1890 he was married to Elizabeth Upham Kingsley, whose sympathetic understanding and cooperation was a continued source of strength and happiness.

His activities were as wide and as varied[1] as his nature was deep and versatile. He favored the League of Nations. He devoted himself to civil service reform, both state and national. He founded the American Association for Labor Legislation and promoted the enactment of a number of laws in the interest of labor. One of these was the national law which ended the "phossy jaw" disease in this country by taxing out of existence the offending industry. He formed and subsidized a committee for the study of tobacco as a fire hazard and in its relation to personal health and economic welfare. He was also a member of the Committee of Fifty, and in that capacity edited its volume on *Economic Aspects of the Liquor Problem*. He early became interested in the first social settlement in New Haven, known as "Lowell House," and gave it both its New Haven and vacation houses. He belonged to a chapter of the National Aeronautical Society, was

[1] Amer. Econ. Rev. 24, 175–177 (March, 1934).

chairman of the State Commission of Sculpture, was a member of the Elizabethan Club of Yale, and wrote a memoir of his father Henry Farnam (1889) and an entertaining book on "Shakespeare's Economics" in 1931.

In the field of strict scholarship, besides numerous articles in American and German publications, he wrote (among other works) "Die innere Französische Gewerbepolitik von Colbert bis Turgot" (1878), "Die Amerikanischen Gewerkvereine" (1879), Chapters on "Government Insurance and Workingmen's Insurance in Germany," in *Yale Readings in Insurance* (1909); and The Economic Utilization of History (1913). He edited seven volumes of Contributions to American Economic History, the last of which was published in 1933, and he had completed many years before his death the preliminary research and some of the final copy of his own contribution to the series: A History of Social Legislation in the United States. This was in connection with the Carnegie Institution of Washington and with the board of Research Associates in American Economic History. For his editorial work he received a medal from the National Institute of Social Science in 1920.

IRVING FISHER.

JOHN RIPLEY FREEMAN (1855–1932).

Fellow in Class I, Section 4, 1913.

In the death of John R. Freeman on October 6, 1932, the Academy lost one of its outstanding members and the engineering profession one of its great leaders. Born on a farm in Maine in 1855, educated in Maine and Massachusetts, and living for the greater portion of his life in Massachusetts or Rhode Island, he was by birth and training a true representative of New England and showed throughout his long life those qualities which many of us believe are particularly representative of New England leaders; integrity, vision, thoroughness, mental and physical strength, and unrelenting industry.

A full account of Dr. Freeman's activities and writings appears in the "Supplement to John Fritz Medal Book" published by the American Society of Civil Engineers in 1934, hence the writer will confine himself to giving in this memoir only a brief outline of his life.

While a student in the Civil Engineering course at the Massa-

chusetts Institute of Technology, young Freeman spent some of his summer vacations working in hydraulic engineering with the Essex Company at Lawrence, Massachusetts; where, through contacts with those early leaders of hydraulic engineering, Mills and Francis, he acquired an enthusiasm for hydraulic engineering and research which persisted throughout his life. In this field he first attained distinction by his paper entitled "Experiments Relating to the Hydraulics of Fire Streams" published in 1889, for which he was awarded the Norman Gold Medal of the American Society of Civil Engineers. In 1900 he reported to the Comptroller of the City of New York the results of an exhaustive investigation of additional water supplies for the City which led to the development of the Catskill Water Supply, and from 1905 to the date of his death he served as Consulting Engineer to the New York Board of Water Supply. Many other communities sought his advice on water supply problems, among which may be mentioned San Francisco, Los Angeles, and the City of Mexico. He was also engaged from time to time by important private companies to advise upon water power developments. Of particular interest to Bostonians was his investigation of the feasibility of damming the Charles River, upon which was based the legislative act authorizing the construction of the Charles River Basin.

His engineering accomplishments early attracted the attention of educational institutions. In 1891 and again in 1892 he was offered by President Eliot the professorship of Civil Engineering in Harvard University, which he declined—considering himself better adapted for business life.

On the retirement, in 1907, of Dr. Henry S. Pritchett from the position of President of the Massachusetts Institute of Technology, Mr. Freeman was asked by President Pritchett, with the approval of the Executive Committee of the Institute corporation, if he would consider becoming his successor. This honor he declined. However, he served the Institute of Technology as a member of the Corporation from October 1893, to the date of his death.

Other educational institutions recognized his attainments by granting him honorary degrees, of which he received five from American and foreign universities.

Dr. Freeman's interest in hydraulic research led to his presentation in 1924 of $25,000 each to the American Society of Civil Engineers,

American Society of Mechanical Engineers, and the Boston Society of Civil Engineers, the income to be used for the aid of young engineers, particularly those engaged in research work. In addition to the gift of these funds, he assisted financially several students studying hydraulics abroad under college scholarships. He made numerous trips to Europe in order to keep himself informed of what was being done there and to confer with and assist the holders of the Freeman Scholarships.

He also inspired and edited the massive volume published by the American Society of Civil Engineers in 1929 entitled "Hydraulic Laboratory Practice," and it was largely due to his efforts that the National Hydraulic Laboratory was constructed in Washington.

Dr. Freeman's accomplishments in the engineering field would have been enough to suffice most men, but, with his unbounded energy and physical and mental strength, he was able to make a reputation in another field—that of Fire Insurance. In 1886 he became engineer and special inspector for the Associated Factory Mutual Fire Insurance Companies at Boston and remained with these companies for ten years when he resigned to become President and Treasurer of a similar group of Mutual Fire Insurance Companies with offices in Providence, Rhode Island, which position he held until the day of his death. During his administration the insurance in the companies under his management increased more than forty fold. He kept his interests in fire insurance and engineering apart, and many of his engineering acquaintances had no knowledge of his prominence in the field of fire insurance.

One of the last of his major activities was the production of a comprehensive treatise entitled "Earthquake Damage and Earthquake Insurance," consisting of a study of rational bases of earthquake insurance and data for earthquake resisting construction. In connection with his activities in this field he sponsored and financed the visit to this country of the leading Japanese authority on earthquakes—Kyji Suyehiro—who spoke on this subject at a considerable number of American universities and elsewhere.

His successful accomplishments led to honorary membership in engineering societies and at the time of his death he was an honorary member of the American Society of Civil Engineers, the Boston Society of Civil Engineers, the New England Water Works Associa-

tion, and the Providence Engineering Society. Posthumous award of the John Fritz Gold Medal for 1934 was recommended by the Board of Award in October, 1933, and was presented at the Annual Meeting of the American Society of Civil Engineers in January, 1934, his son, John R. Freeman, Jr., receiving the medal on behalf of the family.

Doctor Freeman's active professional life was coincident with the progress of engineering in the United States from a little known and little understood occupation to a profession of outstanding importance in world activities. Perhaps no one man of his era played a greater part than he in bringing about this result, and his life and work will ever serve as an inspiration to other engineers.

CHARLES M. SPOFFORD.

SIR ARCHIBALD GEIKIE (1835–1924).

Foreign Honorary Member in Class II, Section 1, 1900.

Sir Archibald Geikie became the leading British geologist of his time. He was born in Edinburgh, the son of a gentleman of moderate means and cultivated tastes. During four years in the Edinburgh High School, Archibald acquired a strong love for the Latin and Greek classics, and at the same time a great enthusiasm for natural history, especially for geology, stimulated by finding abundant fossils during holiday excursions with his school mates.

In 1850 an old family friend offered him a position in a bank. In preparation for this, he spent two years in the uncongenial atmosphere of a lawyer's office. In the mean time, he made friends among local geologists, and, after studying chemistry and mineralogy under private teachers, in November 1854 he matriculated at the University of Edinburgh, where during one year he excelled in classics and English. But his father having suddenly been called upon to pay a large sum of money, he was obliged to leave the University at the end of the year. Then came the longed for opportunity.

At the age of twenty (1855), he was appointed assistant on the Geological Survey under Sir Roderick Murchison. He did such excellent work in the complicated regions of the Highland schists and on problems relating to glacial geology, that, when a separate branch of the Geological Survey of Great Britain was established for Scotland

in 1867, he was so favorably known that he was made its Director. This position he held until 1881.

When Sir Roderick Murchison founded the chair, he nominated Geikie to be the first Professor of Geology and Mineralogy in the University of Edinburgh, and this position he held with the other from 1871 to the end of 1881. At the beginning of the next year he became Director-General of the Geological Survey of the United Kingdom. From this position he retired in 1901.

He was elected Fellow of the Geological Society of London in 1859 and F.R.S. in 1865.

In 1871 he married Alice Gabrielle Pignatel, whose widowed mother was English and then living in London. They had four children.

For a review of Geikie's achievements as a geologist, the reader is referred to the Proceedings of the Geological Society of London for 1925.[1] Besides numerous contributions in technical journals and reports, he published a number of books, among which may be mentioned his Text-Book of Geology, 1882 (4th edition 1905), and Ancient Volcanoes of Great Britain, 1897.

He visited the United States twice, giving lectures in Boston (1879) and in Baltimore (1897). Those of the latter occasion appeared as "The Founders of Geology," 1897 (2nd edition 1906).

Many honors came to him at the hands of governments, universities, and societies, at home and abroad. He was knighted in 1891 and created K.C.B. in 1907.

During ten years (1903–1913) following his retirement from the Geological Survey, Geikie's chief occupation was the business of the Royal Society, first as General Secretary and later as President. The close of that period was marked by the bestowal upon him of the Order of Merit, an honor especially cherished as coming exclusively from the hands of the King. He retired to a country place he had built in Surrey not far from London and there occupied himself pleasantly in the preparation of an autobiography.[2] It was finished at almost the close of his life, and is an important contribution to the history of science.

H. W. SHIMER.

[1] Quart. Jour. Geol. Soc. **81**, lii–lx.

[2] "A Long Life's Work," London: Macmillan, 1924.

VICTOR GOLDSCHMIDT (1853–1933).

Foreign Honorary Member in Class II, Section 1, 1914.

Professor Victor Goldschmidt, Foreign Honorary Member of the Academy since 1914, died in Salzburg, Austria, on the 8th of May, 1933. He was born in Mainz, Germany, in 1853 and very early in his career entered upon his life work, the formulation and interpretation of the data of mineral crystallography. He began his life-long residence at Heidelberg in 1888, first as docent, later as professor (extraordinary) of crystallography. Possessed of abundant means, he established his own Institute, where all his work was conducted and where he accumulated an unrivalled library of mineralogy and an important collection of crystals which was the basis of a long series of important researches. Students came to him from many lands and carried his new methods of description away with them. And he preserved his close friendship with this ever-widening circle of disciples by untiring correspondence and by visits in person, which took him twice to America and once around the world.

Goldschmidt's enduring monument is the series of works in which he presented his laborious collation of the whole literature of the crystal forms of minerals. The first of these works to be published was the *Index der Krystallformen* published from 1887 to 1891. The introduction to this catalogue of the known crystal forms of all the minerals developed a new system of nomenclature and a new mode of defining the angular relations of the faces of crystals. New instruments for measuring crystals were designed by him and elaborated by his private mechanic; and the two-circle goniometer, which was the direct outgrowth of his ideas, has become the standard instrument of the present day. To meet the needs of the new methods, new tables of angles were necessary and these he calculated with an incredible outlay of energy and published in 1897 as *Krystallographische Winkeltabellen*. Next began the compilation and publication of all published figures of crystals of minerals. This *Atlas der Krystallformen*, in nine quarto volumes of plates with accompanying volumes of explanatory notes, appeared from 1912 to 1923.

The publication of these various works was never permitted to interrupt the steady stream of papers from Goldschmidt's pen in which he used the materials thus laboriously made available or added new studies which illustrated his methods of calculation.

Growth and solution forms and vicinal planes, "Accessorien" as he called them later, were first brought adequately into the range of goniometric study by the development of his new instruments and were used to illumine the form series of minerals. Many papers were devoted to the discussion of the distribution of forms in zones; these investigations had as a major outcome the formulation of his "Law of Complication" and his theory of Harmony. In the latter a number law derived from crystals is extended to the discussion of serial arrangements as widely diverse as color scales, musical scales, and the spacing of the planets in the heavens. These philosophical developments of crystallographic studies, which included a new analysis of musical harmony and a theory of the development in man of the color sense, increasingly occupied his interest during his later years. But Goldschmidt's devotion to crystal morphology remained dominant and at the time of his death he was enthusiastically entering a new field of study, seeking to apply to the points of the interference figure of Laue X-ray photographs the law of complication derived from the study of crystal faces.

In 1916 Professor Goldschmidt and his wife established and endowed the "Josefine und Eduard von Portheim-Stiftung für Wissenschaft und Kunst" as an adjunct to the University of Heidelberg. One branch of this foundation is the "Victor Goldschmidt Institut für Kristallforschung," an institute which will inherit his library and collections and insure the continuation of his monumental work through the years to come. It is allied to, but independent of, the University.

In 1928 in celebration of his seventy-fifth birthday a handsome *Festschrift* was presented to Goldschmidt by his students. The introduction by Dr. Milch, Goldschmidt's first student, gives an admirable picture of his life and work. Appended is a complete list of his publications numbering 177 up to that time.

Goldschmidt has left to the students of crystal morphology an inexhaustible mine of material to be drawn upon by later workers. New methods which he introduced will doubtless be modified: his theories of crystal growth may be outmoded: but his work ended an era. And future progress in the description of crystals will necessarily be founded upon his monumental works.

CHARLES PALACHE.

FRITZ HABER[1] (1868–1934).

Foreign Honorary Member in Class I, Section 3, 1914.

Fritz Haber was, without doubt, the most versatile, and, many will agree, the leading chemist of his generation. The demands of modern science force a leader of thought into high specialization. Haber rose above this tendency. His preparation for work in chemistry was attained by attendance at the Universities of Heidelberg, Berlin, Jena, and Zurich and at Karlsruhe, and he had his interest aroused in many fields of chemistry by the men under whom he studied. Upon the completion of his training he entered the chemical industry and there gained a point of view that was an important factor in his subsequent work. He stood preëminent in the application of pure science in the solution of industrial problems of world significance. His synthesis of ammonia from the hydrogen contained in water and the nitrogen of the air, which he developed through large scale production, was the basis upon which he was awarded the Nobel prize in 1918. This great contribution to industrial chemistry came at a most opportune time for Germany. As it is possible to convert ammonia into nitric acid, which is used in making explosives, Germany was in a position to wage war without reliance upon the well nigh impossible importation of a chemical necessary in the manufacture of munitions. Haber's success led immediately to research throughout the world in allied fields in which reactions were studied under the influence of catalysts and high pressures. His work has led to most important developments in industrial chemistry.

Haber's versatility was shown by contributions of a fundamental nature in physical, electro, organic, inorganic, analytical, and biochemistry. He showed himself to be a pioneer by his books, published when a young man, on "Thermodynamics of Technical Gas Reactions" (1905) and on "Technical Electrochemistry" (1898). He was one of the earliest workers in the field of electron emission from heated metals.

It was the good fortune of the writer to spend a year in Haber's laboratory (1910–1911) when he was completing his work on ammonia

[1] References: Brief biography with portrait in "Die Nobelpreisträger" by Victor Junk; Address by Paul Askenasy on Haber's sixtieth birthday, Zt. für angewandte Chemie, **41**, 1289 (1928); Address by W. Schlenk before the German Chemical Society, Ber. d. deutsch Chem. Ges., **67**, A 20 (March 1934).

and opening up new lines of work. He was also busy in organizing, building, and equipping the laboratory of physical chemistry of the Kaiser Wilhelm Institute, of which he had been appointed the first Director. Haber was a good lecturer, had an agreeable personality, and was pleasingly informal with his students. He was a rapid thinker, was sure of his opinions, and was ever ready to combat others who did not agree with him.

Fritz Haber was born December 6, 1868. In 1894 he was appointed an assistant at the Technische Hochschule at Karlsruhe, in 1898 ausserordentlicher Professor and in 1906 Professor and Director of the Physico-chemical Institute. During the World War he was the technical head of the chemical warfare service of Germany. Subsequently he made for his government a world survey of the gold content of sea water, in which he developed new analytical methods of great refinement for the quantitative determination of the metal. He died January 29, 1934.

JAMES F. NORRIS.

ELIJAH CLARENCE HILLS (1867–1932).

Fellow in Class IV, Section 3, 1918.

Elijah Clarence Hills was born at Arlington, Illinois, on July 2, 1867. His early training was received in part in North Carolina. He graduated with the degree of A.B. from Cornell University in 1892, and then spent a year there as a fellow in Romance languages. During 1893–1894 he studied Romance philology at the University of Paris. In 1906 he was awarded the degree of Ph.D. by Colorado College and, at the same time, Rollins College bestowed upon him the honorary degree of Litt.D. On June 22, 1890, he married Metta Vergil Strough; to them came four children—Elijah Justin, George Strough, Clarence Ballard, and Ruth.

Not long after his sojourn at Paris, Professor Hills joined the staff of Rollins College in Florida, and remained there as professor of modern languages from 1896 to 1901, acting also as President for a short while. Because of threatened tuberculosis he moved to Colorado Springs, and at Colorado College he was professor of Romance languages from 1902 to 1918. During 1916 to 1918 he was on leave of absence from his post at Colorado College; for the first part of this

period he was Librarian of the Hispanic Society of America in New York City, and in the latter part he performed editorial work in the New York offices of the publishing firm of D. C. Heath and Company. He received a call in 1918 to the University of Indiana where he became professor of Romance languages and head of the Romance department; after fulfilling the duties of this office for four years, he passed to the University of California and there he was professor of Spanish from 1922 to 1924, and professor of Romance philology from 1924 to his death on April 21, 1932.

During the summer of 1900, Professor Hills was one of the Spanish-speaking instructors appointed by President Eliot and the Fellows of Harvard College to instruct the two thousand teachers brought from Cuba to Cambridge; in 1911–1912 he was again at Harvard as the exchange professor from Western institutions.

Professor Hills was a member of many organizations occupied with the teaching of modern foreign languages. Among his most notable distinctions were these: he was a Fellow of the American Academy of Arts and Sciences, elected in 1918, a member of the Hispanic Society of America, a member of the Société de linguistique of Paris, and a Corresponding Member of the Spanish Academy. The Spanish government made him a Knight-Commander of the Order of Isabella.

Professor Hills's publications relate chiefly to the languages and literatures of the Hispanic peninsula and of Hispanic America, and to modern French and its literature. In collaboration with Professor J. D. M. Ford he issued a *Spanish Grammar* (1904), a *First Spanish Course* (1917), a *Portuguese Grammar* (1925), and a *Spanish Grammar for Colleges* (1928). Of these books about a million copies have been sold. His other works embrace numerous annotated Spanish and French texts and a variety of learned articles on matters of phonological and literary interest.

Fighting for a protracted period against serious ill health, Professor Hills preserved always a serene and courageous attitude. He was a thoroughgoing Romance philologist, searching in his methods of investigation and lucid in his exposition of results. His was a kindly spirit and one that easily won the good will of his colleagues and his students. The world is much the poorer for his departure, and the writer of this notice is deprived of a loved co-worker.

J. D. M. Ford.

WILLIAM HENRY HOLMES (1846–1933).

Fellow in Class IV, Section 4, 1919.

William Henry Holmes, the son of Joseph and Mary Heberling Holmes, was born near Cadiz, Ohio, on December 1, 1846 and died at Royal Oak, Michigan on April 20, 1933. He had little academic training and never received a college degree. Early in life he developed great skill with his pencil. A year in Germany studying art and visiting the European museums served to crystallize this talent. It was owing to his abilities in drawing that he entered the United States Geological Survey in 1872 under F. V. Hayden. He soon became much interested in geology, becoming assistant geologist two years later. The Far West excited his talents and the hundreds of drawings showing exact physiographic features, especially those of the Grand Cañon, have never been equalled. About 1875 the cliff dwellings on the San Juan in Colorado served to fasten his interest on the early works of man in America and this subject became the dominant concern during the remainder of his life. Primitive art was his special province, as shown in several pioneer papers in the early Reports and Bulletins of the Bureau of American Ethnology. In 1882 he became Curator of Aboriginal Ceramics in the United States National Museum and, shortly after, was transferred to the Bureau of American Ethnology of the Smithsonian.

Holmes became the leader of a group who arrayed themselves against the previously generally accepted belief that man lived in the New World contemporaneous with the glacial period. He was the last remaining American archaeologist who believed that Asiatic influences could be found in the development of the Maya civilization. The work for which he is most famous is his "Archaeological Studies among the Ancient Cities of Mexico," a publication of the Field Museum, Chicago, where he served as Head Curator of Anthropology from 1894 to 1897. His relatively short trip to Mexico and Central America resulted in a book which is still most essential for its detailed architectural drawings of ancient buildings. His famous sketches of ruined sites have been more often reproduced than any other single feature connected with Middle American archaeology.

Returning to the Smithsonian in 1897, he was appointed Head Curator of Anthropology in the United States National Museum, and served in this position for over twenty years—interrupted, from

1902 to 1909, when he succeeded Major J. W. Powell as Chief of the Bureau of Ethnology. The National Museum under his guidance became a model of its kind. In 1920, he was elected the Director of the newly established National Gallery of Art.

He was a member of the National Academy, a member and former president of the Washington Academy of Sciences and of the Cosmos Club. His membership also included the National Institute of Fine Arts and the Royal Anthropological Institute of Great Britain. He received the Loubat Prize from Columbia University in 1898. Noted as a mountain climber, he was the first to ascend several high peaks in the Rockies and two mountains have been named for him. On his seventieth birthday his colleagues and friends presented him with a *Festschrift*. His bibliography includes almost two hundred books and papers.[1]

He is the last of the group of the pioneers in American archaeology, which include Brinton, Putnam, Cyrus Thomas, and Fewkes.

ALFRED M. TOZZER.

JOHN HORNE (1848–1928).

Foreign Honorary Member in Class II, Section 1, 1925.

On January 1, 1848, John Horne was born at Campsie in Scotland, the land where Hutton and Playfair had laid the foundation of sound, modern geology. Educated at the High School and University of Glasgow, a student under Lord Kelvin, Horne joined the staff of the Geological Survey of Scotland in 1867. From 1901 to 1911 he served as its Director. Throughout his many years of active field work he was completely associated with his colleague, Dr. B. N. Peach. Such a degree of coöperation as that between the brilliantly suggestive, intuitive Peach and the cautious yet open-minded, coolly rational, and thoroughly skilled Horne has seldom been matched in the history of science. The two men were the "Castor and Pollux," the "Investigator Twins," of British geology. The fused products of their labors were related to many phases of their science, but these inseparable men will always be particularly famous for their elucidation of earth structure in the complicated Southern Uplands and the

[1] See "American Anthropologist" (n. s.) Vol. 35, pp. 755–764, 1933.

Northwest Highlands of Scotland. Their memoir on the latter region, where Peach and Horne finally demonstrated the slicing of the earth's crust and the bodily thrusting of thick slice on thick slice, is destined to be a permanent classic in geological science. The two masters began a comprehensive work on Scotland, but only a part of it was completed, this being posthumously published in 1930 under the title "Chapters on the Geology of Scotland." Horne himself died on May 30, 1928, "leaving a great name and a memory that is sweet and fragrant."

From 1915 to 1919 Horne was President of the Royal Society of Edinburgh. He was President of the Geological Section of the British Association for the Advancement of Science; long a responsible Vice-President of the Royal Scottish Geographical Society. He was given honorary doctorates by the universities of Aberdeen, St. Andrews, and Edinburgh, and in 1900 was elected to Fellowship in the Royal Society of London. He was awarded the Neill Medal of the Royal Society of Edinburgh, and the Wollaston Fund, Murchison Medal, and Wollaston Medal of the Geological Society of London. But the record of this genial leader will receive still greater appreciation in the future, as his technical skill and his power of imagination, always under the control of indisputable facts, continue to influence generation after generation of geologists the world over.

REGINALD A. DALY.

FRED DAYTON LAMBERT (1871–1931).

Fellow in Class II, Section 2, 1914.

Professor Fred Dayton Lambert was born at Muscatine, Iowa, October 28, 1871, and received his early training in public schools of that town. A boyish interest in natural history developed early. His father's desire for him to study medicine and his interest in natural history led him in 1891 to matriculate in Tufts College, where he came under the influence of Professor John Sterling Kingsley, one of the leading zoologists of his day.

Kingsley soon recognized young Lambert's bent for biology and his exceptional skill in drawing. As a student assistant in biology Lambert showed much originality and ability. Through Kingsley's influence Lambert's parents were persuaded to let him work for his

doctorate in zoology. Three degrees were acquired at Tufts, Ph.B. in 1894, A.M., Ph.D. in 1897.

Although Lambert's doctor's thesis was based upon the study of the circulatory system of the salamander, most of his research and teaching was done in the field of botany. Through the influence of Professor J. E. Humphrey at Woods Hole, Lambert became interested in algae and became one of the leading algologists in America. Together with Mr. F. S. Collins he made a study of the green algae of North America, which appeared in the series of Tufts College *Studies*.

After his graduation Lambert became an instructor in biology in Tufts for the year 1897–98. The next year he served as sub-master in the Edward Little High School of Auburn, Maine. From 1899 to 1904 he was instructor in natural history in Tufts College, Professor of Biology from 1904 to 1913, and Professor of Botany from 1913 to 1931.

In 1903 he married Mary Anna Ingalls of Auburn, Maine, who survives him. A single child, Elizabeth Allen, was born to them.

The year 1910 was spent by Professor and Mrs. Lambert in Europe, where he studied botany with Oltmanns in Freiburg and spent several months at the Stazione zoologica in Naples.

Professor Lambert was a member of the American Academy of Arts and Sciences, Phi Beta Kappa, American Association for the Advancement of Science, Botanical Society of America, New England Botanical Club (President 1914–17), Boston Society of Natural History.

While he published few scientific papers, these were genuine contributions to our knowledge of the life histories of algae. His chief interest was in his students by whom he was greatly beloved. Rarely a year passed when one or more students were not influenced to take up the study of algae as an avocation. His power of clear exposition was remarkable and he succeeded in infecting many with his zest for knowledge. He was a friendly man with democratic sympathies and with a genius for making friends among all classes of people.

HERBERT V. NEAL.

JAMES ARNOLD LOWELL (1869–1933).

Fellow in Class III, Section 1, 1932.

James A. Lowell was born at Newton on February 5, 1869; educated at Harvard College (A.B. 1891) and Law School (LL.B. 1894). He came of a family long connected with the United States District Court, which had furnished a reporter and two judges to that court. He practiced law (with his father and brother) in Boston for 28 years, being at the same time a member of the state legislature, and a member of several important commissions. In 1922 he was appointed a judge of the District Court, and continued in that position until his death on November 30, 1933.

As a judge, Lowell thought for himself and was not afraid to decide a case as his own idea of the law led him. He was the first to hold good a marriage by proxy, good where made; and his opinion is the leading opinion on the subject. He refused to give up on interstate rendition an accused negro to Virginia, on the ground that he would be denied a fair trial; and although he was severely criticised and an attempt was made in Congress to impeach him, and although his judgment was reversed in the Circuit Court of Appeals, his decision remains an example of his courage, his originality of mind, and his thinking for himself.

J. H. Beale.

RICHARD COCKBURN MACLAURIN (1870–1920).

Fellow in Class I, Section 2, 1911.

Richard Cockburn Maclaurin was born in Lindean, Scotland, June 5, 1870. He came of distinguished ancestry, being directly related to Colin Maclaurin, the famous mathematician of the early eighteenth century. His father, a minister of the Scotch Presbyterian Church, moved with his family to New Zealand when Richard was five years old and it was there that he received his early education. It was assumed by his father, who was his first teacher, that he was to become a teacher of mathematics, for which science he showed great ability at an early age. When thirteen years old he went to Auckland to prepare for University College. There he made his B.A. and M.A. degrees with distinction, but having won competitive

scholarships in two colleges at Cambridge, England, he completed his education in England. He entered St. John's College, Cambridge, in 1892 where he made an extraordinarily brilliant record. He was not only first in the mathematical tripos of 1896, but the following year was awarded the coveted Smith Prize in Mathematics, the significance of which may be appreciated when it is recalled that previous recipients included such names as Sir John Herschel, Sir George Stokes, Lord Kelvin, Lord Rayleigh, James Clerk Maxwell, Sir George Darwin, Sir Joseph Larmor, Sir J. J. Thomson. He was honored by being elected a Fellow of St. John's College.

The following year he also won the Yorke Prize—the highest award in the field of Law—for a thesis on "The Title to Reality." This very unusual achievement was commented upon by the Cambridge University Review as follows:

> "This Yorke Prize Essay is in many respects a notable work. It is conferred on Mr. Maclaurin who has distinguished himself in a way that is, we believe, unique in the modern history of the University. He has gained the two most coveted university prizes that are awarded for originality in two completely distinct branches of learning—Mathematics and Law."

In 1898 Dr. Maclaurin was offered the chair of Mathematics at Victoria College, Wellington, and returned to New Zealand. There he began important researches in Mathematical Physics, particularly in the field of Physical Optics, which he published in a treatise entitled "Theory of Light." In recognition of the importance of this work, the University of Cambridge conferred upon him the degree of Doctor of Science in 1908. He also devoted much attention to the educational problems connected with the University and was instrumental in establishing the Law School, of which he was Dean from 1905 to 1907.

When, in 1905, Columbia University sought to fill the chair of Mathematical Physics, a world-wide survey of leading physicists resulted in the choice of Dr. Maclaurin for the position. He accepted the call to Columbia in 1907 and with his family took up his residence in New York. His wide interests and remarkable abilities, not only as a scientist but also as an educator, were at once recognized, and it did not take long to convince the Corporation of the Massachusetts Institute of Technology that in him were combined

those qualities for which they had been seeking for several years in a new President. Dr. Maclaurin was offered the Presidency of the Massachusetts Institute of Technology in November 1908 and was inaugurated on June 7, 1909. His presidency was one of the most brilliant in the history of the school. It was due to his vision and untiring efforts that he was able to raise funds, not only for rebuilding the Institute on its present site in Cambridge, but for its endowment. Technology moved to Cambridge and the new buildings were dedicated in June 1916. When, the next year, the United States entered the war, Dr. Maclaurin was appointed Educational Director of the Student Army Training Corps under the War Plans Division of the General Staff and devoted himself untiringly to this work until its close. The facilities offered by the Institute's new plant and equipment for the training of officers and for research connected with the national defense were at once organized by him and placed at the service of the government.

In January 1920 Dr. Maclaurin was to announce at a Jubilee Banquet of the Technology Alumni the name of the Institute's great benefactor, Mr. George Eastman. It was not possible, however, for him to attend the dinner owing to an attack of pneumonia, from which, in a weakened condition due to overwork, he was unable to recover. He died, January 15, 1920, just as he saw his ambitions for Technology realized.

The love and esteem with which Dr. Maclaurin was held by his colleagues could not be better expressed than by the tribute written at the time of his death by Professor William T. Sedgwick, senior member of the Faculty:

> "Dr. Maclaurin's life and work will be for us ever a shining example pointing towards the lofty heights of his ideals. His was a world career. No narrow limitations of his native Scotland hedged him in. New Zealand beckoned him and he went. America called him and he came. As a great man of science he studied deeply, planned carefully, acted boldly. As a worker he was indefatigable; as a student modest and profound; as a friend faithful unto death; as a leader we shall not look upon his like again."

It is well said that his monument is the new Technology on the banks of the Charles.

Dr. Maclaurin was the recipient of many honorary degrees: Uni-

versity of Cambridge, LL.D. 1904; University of Cambridge, Sc.D. 1908; Dartmouth College, Sc.D. 1909; Wesleyan University, LL.D. 1909; Harvard University, LL.D. 1910; Denison University, LL.D. 1914.

His membership in numerous academies and scientific societies is recorded in "American Men of Science."

In 1904 Dr. Maclaurin married Miss Alice Young of Auckland, New Zealand. Mrs. Maclaurin and two sons, William Rupert Maclaurin and Colin Maclaurin, survive him.

H. M. Goodwin.

JOEL HASTINGS METCALF (1866–1925).

Fellow in Class I, Section 1, 1911.

The mind of a theologian frequently turns to the stars for diversion. Thus it was with Joel H. Metcalf. Born in Meadville, Pennsylvania on January 4, 1866, he was a minister of the Unitarian Church from 1891 to the time of his death in 1925. His religious training was obtained from the Meadville Theological School, supplemented by advanced study at the Harvard Divinity School and at Allegheny College where in 1892 he received the Ph.D. degree. The honorary degree, Doctor of Divinity, was conferred upon him in 1920 by the Meadville Theological School.

Throughout his very busy life as a minister, astronomy was his avocation. The stars had from boyhood exercised a great fascination upon him. When but twelve years of age he fed his fancy upon astronomical books from the Sunday School library, such as Proctor's "Other Worlds than Ours," and with interest quickened by the solar eclipse of 1878, he commenced star-gazing with an abandoned lens which he picked up and mounted.

In the early days of his ministry, when at Burlington, Vermont, he bought a second-hand photographic telescope, but there is no record of definite work before 1903 when he went to Oxford University. He had been advised to take a year's rest. Rest meant to him a change of activity, as evidenced by his strenuous courses in theological subjects at Manchester College, and also by his participation in astronomical work at the University Observatory under Professor Turner's leadership. The Oxford Zone of the Astrographic Chart,

the Great Star Map, was being carried on, and the young American preacher was initiated into the art of taking and measuring photographic plates. In March 1904, he published in the Monthly Notices of the Royal Astronomical Society a paper based upon some of his work at the Oxford observatory, entitled "Positions and Photographic Magnitudes of Ninety Stars surrounding the Variable, R Cygni."

Returning to America, he was minister for several years at Taunton, Massachusetts, where he established a private observatory fitted with a 10-inch telescope of his own construction. At this time he started surveys for the discovery of minor planets, by his own method of guiding the telescope according to the estimated motion of such an object. The images of stars are accordingly trailed, but an object in the solar system, if present, forms a dot more or less round. By this method, very faint asteroids were photographed and discovered. His first successful photographs led him to call at the Harvard Observatory, saying that he had something in which he thought the Director, Professor Edward C. Pickering, would be interested. This call was the beginning of a close friendship for life between the two men, which resulted in Dr. Metcalf's benefactions to the Observatory —the grinding of several excellent lenses. He became exceedingly skilful in applied optics, so that for years he had in this country no superior in the making of photographic lenses. He computed the curves and with something like innate genius ground the glass to excellent form. His skill and zeal resulted in the discovery of forty-one minor planets and numerous variables on his photographic plates. He also found six comets visually with a comet-seeker of his own construction. For five of them which were new, he received medals from various societies.

Unprecedented perhaps was his experience in 1919 while sweeping for comets at his camp on an island in Lake Champlain. On the evening of August 20, he found a new comet and soon after he started sweeping the sky on August 22, another new comet "swam into his ken."

From 1910 to 1920, Mr. Metcalf was minister of the Unitarian Society at Winchester, Massachusetts, only a few miles from the Harvard Observatory. Relations resembling that of son and father arose between him and Professor Pickering. When a Winchester

photograph revealed anything of interest it was at once brought to Cambridge for verification.

Many conferences ensued concerning new telescopes. As a result of this friendship, two of the most useful lenses in making the Harvard collection of celestial photographs, the 16-inch doublet and the 10-inch triplet, were ground gratuitously by Dr. Metcalf. No effort was too great for him to make in order to improve the definition, and when images on plates taken with the 16-inch doublet were poor toward the edges of the plates, he said, "I can do no better unless you can give me curved plates." Professor Pickering offered to think over that subject and the result was that curvature of the plates was obtained by pneumatic pressure.

Dr. Metcalf was a member of the Visiting Committee of the Ladd Observatory and for several years was Chairman of the Visiting Committee of the Harvard Observatory. Besides being a Fellow of the American Academy, he was a member of the American Astronomical Society, whose meetings he frequently attended.

During the Great War, he rendered distinguished service. Receiving a leave of absence from the Winchester Church, he went overseas with the American Infantry as Secretary of the Young Men's Christian Association, and shared the dangers and privations of the common soldier. He was cited for special courage at Chateau-Thierry. Later he took an active part in the reconstruction of Roumania, visiting many parts of the country with considerable risk to life and health.

On his return to this country, he became minister of the First Parish, Portland, Maine, which he held until his death on February 21, 1925. He was survived by his wife and two children, Mrs. Eldredge F. Stoneham and Herbert E. Metcalf.

He died suddenly in the midst of his many church duties and activities. He was also engaged upon making the largest lens known of the triplet form, a 13-inch, which is now in active use at the Lowell Observatory. It has already become a famous telescope because on a photographic plate taken with it in 1930 the faint and distant major planet, Pluto, was discovered.

Dr. Metcalf's scientific activities never dulled his interest in humanity. Always genial, enthusiastic, and energetic, it has been said that his ministry appealed especially to men in all walks of life.

His enthusiasm extended to all forms of human endeavor, and he seemed to be equally at home whether personally conducting parties through Europe, or sweeping for comets on the quiet island.

Generously tolerant to all creeds, charitable to all sorts of people, his own faith stood fast and undisturbed through the many vicissitudes of life.

ANNIE J. CANNON.

EDWARD FURBER MILLER (1866–1933).

Fellow in Class I, Section 4, 1914.

Edward Furber Miller was born January 18, 1866 in Somerville, Mass., the son of William Gibbs and Sarah Furber Miller.

After his early education in the public schools of Cambridge, he entered the Massachusetts Institute of Technology and received the degree of Bachelor of Science in Mechanical Engineering in 1886. In 1921 he was awarded the honorary degree of Doctor of Science by the Rhode Island State College.

Following his graduation from the Institute of Technology he was appointed a member of its instructing staff. In 1892 he became Professor of Steam Engineering; and, on the retirement of Professor Gaetano Lanza in 1911, he was placed in charge of the Department of Mechanical Engineering, which position he held until his death, June 12, 1933, at his home in Newton Center.

Besides carrying his regular work at the Institute during the war, he had charge, by appointment of the Shipping Board of the United States, of the establishment and direction of training schools located in various parts of the country for preparing men for service as engineer officers of the U. S. Merchant Marine. At the close of the war, he was instrumental in the forming of arrangements with the Army and Navy Departments of the U. S. Government for the establishment of special courses at the Institute for Officers of the Army and Navy. He was commissioned a Colonel in the Ordnance Reserve, and in 1921 he was appointed Dean of Army Officers by the Corporation of the Institute.

Following the death of President Maclaurin of the Institute of Technology, he was appointed one of three Faculty members to serve as an Administrative Committee of Institute Affairs until the election of President Stratton in 1923.

He was active in many professional societies. He was a member of the American Society of Mechanical Engineers, the American Society of Civil Engineers, the Boston Society of Civil Engineers, the American Society of Refrigeration Engineering, the National Association of Stationary Engineers, a life member of the Massachusetts Charitable Mechanics Association, and other engineering organizations. He was an authority on the design and operation of steam power plants, and as such served for many years as a member of the Boiler Code Committee and the Power Test Code Committee of the American Society of Mechanical Engineers. His advice as an expert was widely sought by industrial concerns. For many years he served the State of Massachusetts and the cities of Boston and Cambridge on various Boards and Committees.

He was responsible for the design and development of the laboratories of the Department of Mechanical Engineering from very modest beginnings at the old site of the Institute in Boston to the extensive equipment of ten or more laboratory divisions of the Department in the present buildings in Cambridge.

Notwithstanding his heavy administrative duties he continued the teaching of students, in which he was always actively interested. As an expert in his field, he brought into the classroom a fund of knowledge gained from practical experience, by which he was able to give to the students a more thorough and vivid appreciation of what the Mechanical Engineer is called upon to face in the practice of his profession than could be accomplished through the study of books alone.

It may be said that no man in his profession was regarded by his former students with a higher degree of respect and gratitude and affection than was he.

CHARLES F. PARK.

ELIAKIM HASTINGS MOORE (1862–1932).

Fellow in Class I, Section 1, 1901.

Eliakim Hastings Moore was born at Marietta, Ohio, on January 26, 1862. He came of a distinguished family, his father being Bishop David Hastings Moore of the Methodist Episcopal Church. At the age of thirty he was already internationally known as algebraist, group

theorist, geometer, and analyst of high rank, and was called to be professor and head of the department of mathematics at the newly founded University of Chicago. He remained at Chicago in that position until his death on December 30, 1932.[1]

During the last twenty-five years of his life, his mathematical interests were in the field which he called General Analysis. While his published work during this period was not extensive, there can be no question that the number of his creative ideas was large. These ideas were shared freely by him with his students and colleagues; but a desire for perfect formulation by means of a definitive symbolism interfered with publication. His General Analysis foreshadowed a good deal of European mathematics which has arisen since, although it is not likely that Moore will receive full credit for what he did. He himself felt in his later years that publication of his results did not interest him greatly.

Moore will always be remembered by the many who knew him as lovable and inspiring to an extraordinary degree. He appreciated deeply the beauty of mathematics and communicated this appreciation to others. Among his many students have been a number of the most important American mathematicians. This has been due in a large measure to the enthusiasm which he inspired in his students and to his generous interest in their scientific development.

The same quality of sensitiveness and desire for perfection that made it difficult for him to publish his work in the latter part of his life showed itself in all of his personal relations. He was utterly lacking in any selfish interest and sought ardently for the ideal in so far as he could achieve it.

When the astonishing history of the development of American mathematics during the past forty years is written, Moore will certainly take a very high place in it as a great and beloved leader.

GEORGE D. BIRKHOFF.

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[1] His colleague, Professor G. A. Bliss, of the University of Chicago has published two biographical notes, to which the reader is referred for a detailed account:

Eliakim Hastings Moore, Bulletin of the American Mathematical Society, Vol. 39, 1933.

Scientific Work of Eliakim Hastings Moore, *ibid.*, Vol. 40, 1934.

EVERETT MORSS (1865–1933).

Associate, 1925; Fellow in Class III, Section 4, 1932.

Everett Morss died on the 27th December, 1933. The son of Charles Anthony and Mary Elizabeth Wells Morss, he was born in Boston the 6th of March, 1865. He was graduated from the English High School in 1881 and from the Massachusetts Institute of Technology with the degree of Bachelor of Science in Mining Engineering in 1885. In 1923 the honorary degree of Master of Arts was conferred on him by Tufts College.

Boston, in which he was born and educated, and its immediate vicinity continued to be for his whole career the centre of his many activities and happy family life. Immediately after his graduation at Technology he entered his father's business, The Morss & Whyte Company, which at that time was developing black weatherproof wire, a new type of insulated wire for use by electric light companies. In 1895 The Simplex Electrical Company, now Simplex Wire & Cable Company, was incorporated to carry on and further develop the insulated wire business, which by this time had become primarily the manufacture of rubber covered wire. He was Vice-President of the new company from its inception and, following his father's death in 1903, became President, an office which he held at his death. Although he received very able assistance from his brothers and others in the company, his was the guiding spirit. He felt that the developing of the business depended on two main factors: first, the highest possible quality for the standard products of the company, which he attained and developed through painstaking research; and skilful control of factory processes. He was one of the first manufacturers in New England to employ a rubber chemist and his company has always remained in the forefront of rubber technology. Through his ability along these lines he became a recognized leader in the industry throughout the United States.

Most of his time was spent at the factory until he went to Washington in 1917 as a member of the War Industries Board, although he continued always an important factor in formulating the general policies of the company.

After his return from war service in Washington, he was for some time Fuel Administrator of Boston and gave his time to a more general administration of the affairs of his company, although he

still continued to keep close contact with manufacturing problems and developments. Within himself he combined the skilful and resourceful master of industry with the man of broad sympathies concerning all that touched human welfare and happiness.

With a training and mind which made him singularly informed as to both the industrial and scientific side of the arts generally, he was particularly qualified for fellowship in this society. His unfailing interest in all that promoted education, good citizenship, and the wholesome comradeship of joint efforts for better things caused him to give almost over-generously of his time and energies to the institutions and activities with which he was connected. For twenty-seven years he was associated with the affairs of the Massachusetts Institute of Technology, twenty-four of which he served as a member of the Corporation and twelve as Treasurer, which latter position he held at death. During the construction of the new Technology buildings in Cambridge, during the trying period of the War, and during the critical months following the death of President Maclaurin he bore a heavy load of responsibility with cheerfulness, patience, and soundness of judgment. He was active in the Boston Chamber of Commerce and its President in 1931–32. At his death he was President of the Franklin Foundation and director of The First National Bank of Boston, Old Colony Trust Company, Colombian National Life Insurance Company, Liberty Mutual Insurance Company, Arthur D. Little, Inc., Rumford Chemical Works, and, as has been noted, director and President of the Simplex Wire & Cable Company. He was a Fellow of the American Institute of Electrical Engineers and a member of the American Society of Mechanical Engineers.

His interest in all of these associations was active, intelligent, and effective. He brought to their counsels instinctive good judgment and wide acquaintance with men and affairs. Of a perfect serenity of temper, unruffled even by illness and overwork, he united the highest integrity with sound judgment and great amiability of character. Unqualifiedly impatient and indignant at any form of crookedness, he was unwilling to do anyone an injustice, even in casual conversation. His contribution to good citizenship is a cause for gratitude. A good man has died and left the priceless heritage of a good name, and a distinguished example of unselfish devotion to every duty, both public and private.

FRANCIS R. HART.

LYMAN CHURCHILL NEWELL[1] (1867–1933).

Fellow in Class I, Section 3, 1930.

The writer of this memoir was closely associated with Professor Newell first as a fellow student for three years at The Johns Hopkins University and later in many of his activities in promoting organizations to further the development of chemistry. This experience led to a very high regard for his executive ability, his genius as a teacher of science, and his unselfish, unlimited devotion to work for others. Professor Newell's chief interest lay in the improvement of the teaching of chemistry, and in the history of the science. In both fields he applied the methods of research and his findings and conclusions are recorded in many publications. He was the author of ten text books which reflected his study of pedagogical methods based on intimate contact with his students. His books commanded large sales and their use improved markedly the teaching of chemistry in both high schools and colleges.

His interest in the history of chemistry led to detailed study of the development of the science in America. Research brought to light many facts of importance and interest. He was the acknowledged authority in this field. In connection with this work Professor Newell built up a rare collection of books, manuscripts, letters, autographs, portraits, and medals. His lectures to his students in the history of chemistry were made vital by illustrations from his collections.

Professor Newell broadened his influence by leadership in the activities of the American Chemical Society in the History of Chemistry and in Chemical Education. He served as Chairman of the Divisions of the Society devoted to these subjects. His enthusiasm inspired enthusiasm and he brought into the divisions men and women who became active workers. He was the editor of a department in the Journal of Chemical Education and did much to increase the value and influence of the publication. For many years Professor Newell was a dominant figure in the New England Chemistry Teachers' Association, an organization which concerned itself with the teaching of chemistry in high schools.

[1] See also "American Contemporaries: Lyman Churchill Newell" by Tenney L. Davis, Ind. and Eng. Chem., *24*, 1082 (1932) and articles expressing appreciation of Professor Newell and his work by E. O. Holmes, J. P. Mason, A. A. Ashdown, and M. J. Ahern published in The Nucleus of the Northeastern Section of the American Chemical Society, January 1934.

His executive ability was demonstrated for many years by his activities in the Northeastern Section of the American Chemical Society. He served as Chairman of the Section and as chairman of many important committees. He brought to a successful conclusion his suggestion of the establishment by the Section of a medal, named in honor of Theodore William Richards, to be awarded for conspicuous contributions to chemistry.

Professor Newell had many interests outside of chemistry. He was a member of the New England Gladiolus Society and of the Harvard and the Brookline Musical Clubs. He had an attractive personality, a sense of humor, and a genial manner which made for him many friends.

Lyman Churchill Newell was born in Pawtucket, Rhode Island, September 19, 1867. He was awarded the Ph.B. degree by Brown University in 1890 and the Master's degree one year later. He taught for a year in the Pawtucket High School and then entered The Johns Hopkins University and was awarded the degree of Doctor of Philosophy in chemistry in 1895. He was instructor in chemistry at the Somerville English High School 1895–1898, and at the Lowell State Normal School 1898–1904. He was called in 1904 to the headship of the Department of Chemistry of Boston University, where he remained until his death December 13, 1933.

JAMES F. NORRIS.

ERNEST FOX NICHOLS[1] (1869–1924).

Fellow in Class I, Section 2, 1913.

Ernest Fox Nichols was born in Leavenworth, Kansas, June 1, 1869. He completed his undergraduate education at the Kansas Agricultural College, receiving there the degree of Bachelor of Science in 1888. Graduate study of physics was continued at Cornell University under Professor E. L. Nichols, where he took his Master's degree in 1893. In 1892 he was appointed professor of Astronomy and Physics at Colgate University, which position he held during

[1] A very complete and appreciative biographical account of the life and work of Ernest Fox Nichols was prepared by Professor E. L. Nichols and presented at the meeting of the National Academy of Sciences in 1925. See the Biographical Memoirs of the Academy, Vol. 12, p. 99 (1929).

the following six years. During 1894–1896, however, he was granted leave of absence to continue his studies at the University of Berlin and while there he began his fundamental work on residual rays. Upon his return to this country he was awarded the degree of Doctor of Philosophy by Cornell University.

In 1898 Dr. Nichols was called to Dartmouth College as head of the Department of Physics. There he carried on investigations of great importance in the field of radiation. The summers of 1898 and 1900 were spent at the Yerkes Observatory upon invitation of its director, Dr. George E. Hale. Here, with the radiometer which he perfected and an horizontal telescope, he measured for the first time the heat received from several of the brighter stars and from two of the planets. During this same period, in collaboration with his associate, Professor Gordon F. Hull, he not only detected but measured with precision the pressure of light, obtaining results which confirmed completely the predictions of Maxwell's electromagnetic theory. This outstanding contribution was announced at the Denver meeting of the American Association for the Advancement of Science, August 29, 1901. Working quite independently of Nichols and Hull, and unknown to them, Lebedew—at the International Congress of Paris in the summer of 1900—announced that he had detected light pressure of an order of magnitude predicted by theory but no numerical data were given at that time. The quantitative confirmation of the theory is therefore due to Nichols and Hull. The importance of these contributions was recognized by the American Academy of Arts and Sciences in 1904 by the award of the Rumford Medal to Dr. Nichols "for his researches on radiation, particularly on the pressure due to radiation, of the heat of the stars and the infra-red spectrum."

In 1903 after five years of productive work at Dartmouth College, Nichols accepted a call to Columbia University as Professor of experimental physics. The winter of 1904–1905 was spent on leave of absence at the Cavendish Laboratory, Cambridge. His researches during this period were directed to the extension of the spectrum still farther into the infra-red by means of residual rays obtained from various reflecting surfaces. The summer of 1906 saw him pursuing his investigations at the Carnegie Solar Observatory on Mount Wilson. There he measured the absorption of sun light in the infra-red region of the spectrum and proved that beyond 51 μ, waves are completely lacking.

In 1909 Dartmouth College recalled Dr. Nichols, this time as President. This necessitated giving up his cherished scientific work, and for seven years he devoted himself to the upbuilding of the college, which prospered and grew under his administration. In 1916, however, he decided to resign and return to his scientific work, and Yale University at once offered him a Professorship.

As soon as this country entered the world war research work was again interrupted, for Dr. Nichols tendered his services to the National Research Council and under the Navy Bureau of Ordnance devoted himself to problems of the national defense. After the conclusion of the war he was asked to become the director of research at the Nela Park Laboratory in Cleveland. As this involved no teaching and presented an opportunity for devoting himself exclusively to research in the field of light, he resigned his position at Yale and went to Cleveland. A few months later, however, he was elected to the Presidency of the Massachusetts Institute of Technology, which had become vacant through the untimely death of President Maclaurin. He was inaugurated in June, 1921, but almost immediately afterwards was stricken with a serious illness which necessitated his taking a long and complete rest. Upon the insistent advice of his physicians he reluctantly resigned the Presidency of the Institute the following November without having actively assumed the duties of the position.

After a year's rest he had sufficiently recovered to resume his scientific work and was welcomed back to the Nela Park Laboratory. There, in collaboration with Dr. J. D. Tear, he devoted his efforts to bridging the gap between the electrical and infra-red spectrum—the problem which, from his student days in Berlin, had been the goal ever before him. This problem he solved and on April 29 at the spring meeting of the National Academy, the day after its new palatial home had been formally dedicated, Dr. Nichols—while presenting the results of this research before a large gathering of his colleagues—hesitated a moment in his exposition and very quietly sank down on a seat on the platform, dead. Thus passed away one of the most skilful experimental physicists of our generation, at the moment of announcing the successful solution of the problem to which he had devoted the greater part of his life. As his former teacher, Professor E. L. Nichols, has truly said—"What more fitting departure could a man of science desire?"

Dr. Nichols was the recipient of the following honorary degrees: D.Sc., Dartmouth College 1903; LL.D., Colgate University 1909; LL.D., Clark University 1909; LL.D., Wesleyan University 1909; LL.D., University of Vermont 1911; LL.D., University of Pittsburgh 1912; LL.D., Dennison University 1914; LL.D., Dartmouth College 1916.

He held membership in many academies and scientific societies, an enumeration of which is to be found in "American Men of Science."

Dr. Nichols' contributions to science have placed his name high among those of the leading physicists which this country has produced but his high ideals and loyalty, his genial personality and delightful sense of humor are the human qualities by which he is remembered by his colleagues and host of friends.

In 1894 he married Miss Catherine Williams West, of Hamilton, New York, who with a daughter, survives him.

H. M. Goodwin.

GEORGE HERBERT PALMER (1842–1933).

Fellow in Class IV, Section 1, 1912.

George Herbert Palmer was born in Boston March 9, 1842. He died May 7, 1933, having passed by two months his ninety-first birthday. He had long been the oldest in years and in academic seniority on the list of the Harvard faculty, from whose active membership he retired in 1913. As a child he was physically feeble, his schooling frequently interrupted: in spite of this, after two years at Andover Academy, which he entered at twelve, and an interval in the wholesale dry goods trade, he entered Harvard at the age of 18 and graduated in regular course in 1864.

Having decided, during an experimental year of teaching in Salem High School, that his future course would lie between philosophy and letters, he entered Andover Theological Seminary in 1865, receiving the degree of B.D. in 1867. The best opportunities for advanced study in philosophy were to be found at that time in the theological schools, inasmuch as graduate schools in connection with the universities were little developed. Palmer never actually entered the ministry, though he frequently and naturally served as minister at the Harvard chapel and elsewhere; and throughout his life, his thinking easily related itself to theological conceptions. German

philosophy, which he had known chiefly through the writings of Coleridge and F. D. Maurice, attracted him; and he spent in Germany parts of two years. In 1870, President Eliot, then in the second year of his administration, offered him an appointment as tutor in Greek under Professor Goodwin; he entered upon this work in the fall of that year. His association with Harvard College thus spans nearly the whole of the two administrations of Eliot and Lowell.

When he began his teaching, faculty meetings consisted of some thirty men at a long table, with President Eliot at one end. Each member of this small group carried in mind the major part of the business of the university. To the end of his life, Palmer retained the mental habit thus formed of responsibility for the institution as a whole. Though he was especially identified with the department of philosophy, he served at different times in five departments, including English, Fine Arts, Greek, Theology. He will be remembered for his contributions to letters, his translation of the Odyssey, his Life of Alice Freeman Palmer, his edition of George Herbert, as well as for his contributions to philosophy.

He had an active part in the building of the department of philosophy, which included when he entered it in 1872 as instructor, one full professor, Francis Bowen. Palmer aided the coming of William James against some opposition within the department; he and James discerned the outstanding promise of Royce, then an instructor of English in California, and secured him for Harvard by taking successive sabbatical leaves; this trio produced Santayana and Benjamin Rand, and attracted Muensterberg from Germany.

Palmer's teaching in philosophy began with the required elementary course; but in 1879 he offered a course in systematic ethics which in 1884 became the "Philosophy 4" with which his fame as a teacher was especially associated. Into his lectures he carried the qualities which showed the lover of literature and of the classics. His lectures were meaty, and they had pace: they were delivered without hurry, hesitation, or repetition. They constituted well-arranged parcels of thought, with a clarity and pedagogical excellence which often had the paradoxical effect of concealing their actual depth. Clarity, however, was for him an obligation, the first point of honor in the relation of teacher and student; and his perfection of form was the result of severe effort. At first so shy that he could hardly face a

class, and with painful hesitancy for words, he brought himself by the discipline of a relentless will, characteristic of his whole life, to an extraordinary mastery of extempore speech. His utterance abounded in aphorisms, which, as President DeWitt Hyde said, "continued to glow in the dark of the mind."

Perhaps the highest reaches of his power as a teacher were in his biographical sketches of the great philosophers. Here his powers of appreciation and criticism had full play. His elective course in the history of philosophy had as many as four hundred students, a remarkable number in the Harvard of 1890–1900.

Power to reach objective estimates of men, including himself, was one of his marked characteristics. In view of his own belief that the imperfect has its peculiar glories, he was inclined rather to dwell upon the defects of the character he was dealing with than to minimize them: he was a foe of every excess of praise. Owing in part to the relentless realism of his judgment he was widely sought as counsellor in the placing of men. It is a large part of the secret of his own success that he knew and respected his own limitations. Though he was one of the first to respond to the spirit of Eliot's administration by offering systematic courses of his own devising in place of the prevalent text-book-recitation scheme, and although his own works in systematic ethics,—The Field of Ethics, The Nature of Goodness, The Problem of Freedom, Altruism,—are of lasting value, he conceived his own function as that of a critic rather than that of a constructive thinker. And it is as a teacher, transmitting his creative appreciations, that he has had his primary effect.

In 1889 he became Alford Professor of Natural Religion, Moral Philosophy, and Civil Polity. He received honorary degrees from Harvard, Michigan, Union, Dartmouth, California, and Western Reserve.

Though his means were never large, he was a generous and discriminating giver,—to Wellesley a fine collection of first editions of English classics, to Harvard, collections of George Herbert, and of rare editions in philosophy.

Of less than average height and hampered in vision, the impression of his personality was nevertheless one of singular force; this was in part the power of large practical sagacity; it was also the power of clarity, of goodness, and of self-mastery.

WILLIAM ERNEST HOCKING.

EDWARD DYER PETERS (1849–1917).

Fellow in Class I, Section 4, 1914.

Edward Dyer Peters was born in Dorchester, Massachusetts, on June 1, 1849. He died in Dorchester on February 17, 1917. He attended the Episcopal School for boys at Cheshire, Connecticut, and when he was sixteen his father took him to Europe. In 1865, he entered the Royal School of Mines at Freiberg. He returned to the United States in 1869 and settled in Denver, Colorado. In 1871, he was superintendent and metallurgist of the Caribou Mine, at the time the largest silver mine in the country, a position which he resigned in 1872 to accept an appointment from the governor of the territory as territorial assayer for the southern part of Colorado. In the fall of the same year, he built the Mount Lincoln Smelting Works. In 1874, Peters returned to the East, believing that the ores of Colorado had been worked out and that there was little future for mining engineering. He entered the Harvard Medical School, graduating in 1877, first in a class of one hundred and sixty. He practiced medicine in Dorchester until 1880, when he returned to his original profession. In 1881, he married his cousin, Anna Quincy Cushing, and after his marriage we find him associated successively with the Orford Nickel and Copper Company and with the Ely Mine in Vermont. In 1884, he erected the first successful concentrating and smelting work of the Parrott Silver and Copper Company. From 1888 to 1890, he was the general manager of the Canadian Copper Company of Sudbury, Ontario. In 1892, he was called to Tasmania to report on the Mount Lyell Mine. In 1893 and 1894, he worked in Paris at the École des Mines. Upon his return, he continued actively in the practice of his profession until 1904, when he was invited to give a course of lectures on the metallurgy of copper at Harvard University, being appointed Professor of Metallurgy in the fall of that year and Gordon McKay Professor of Metallurgy in 1909, a position which he held until his death.

Professor Peters made notable contributions to the metallurgy of copper through technical papers and the publication of three important volumes:—Modern American Methods of Copper Smelting, Principles of Copper Smelting, and The Practice of Copper Smelting. These were standard books, of which many editions were sold. He

was by general consent the most eminent authority on the metallurgy of copper. His fine upright nature, honesty, and sincerity endeared him to his many friends. He was a gentleman of the old school, courteous, just and tolerant, an exponent of Christian virtues.

ALBERT SAUVEUR.

ARTHUR KINGSLEY PORTER (1883–1933).

Fellow in Class IV, Section 4, 1922.

In 1883 a rare and beautiful spirit came into the world when Arthur Kingsley Porter was born in Stamford, Connecticut. His father was Timothy Hopkins Porter, a banker in Stamford, and his mother was Maria Louisa Hoyt, one of the first women to study at Vassar.

He went to school at King's Academy at Stamford and at the Browning School in New York. He received his degree of Bachelor of Arts from Yale in 1904. After that he went to the Columbia Architectural School for two years and then spent two years of study in France and Italy.

At the age of twenty-five he published his first book, "Medieval Architecture," in two volumes, a remarkable book for a man of his age, and full of promise. Two years later, in 1911, he published his next book, entitled "Construction of Lombard and Gothic Vaults," in which he grappled with problems of significance.

In the following year, 1912, he married Lucy Bryant Wallace. Her untiring energy and complete devotion to him and his work played an important part in his later successes. Among other things she became an admirable photographer and thus helped greatly on that side of his work, which counted so much.

During the years 1915 to 1917 he worked on and published his notable four volume book on "Lombard Architecture." He furnished substantial proof that the ribbed groined vault, on which Gothic architecture depends, was created first in Lombardy, to travel from there to France.

In 1915 he was called to Yale as lecturer in the History of Art, and in 1917 he became assistant professor. In 1920 Harvard offered him a professorship of art with the understanding that he need teach only a small part of the time and that he might feel free to continue

his travels, researches, and publications. In 1924 he became the first incumbent of the newly-created William Dorr Boardman Professorship of Fine Arts.

When he moved to Cambridge he bought Elmwood, formerly the house of Elbridge Gerry, one of the signers of the Declaration of Independence, and later of James Russell Lowell, the poet. The Porters added fresh distinction to the venerable house already rich with associations. They entertained students, friends, and distinguished visitors. Music and poetry played their part at these gatherings. This house he bequeathed to Harvard, subject to a life estate of his wife.

In 1923 Porter was sent by Harvard as exchange professor to Paris and the provincial French universities, and in 1924 as visiting professor to Spain.

As the years went on his reputation grew, and eventually he was recognized in both Europe and America as America's foremost mediaevalist. He was the only American who was asked by the French Government to serve on the commission to inspect the precious early buildings injured in the World War. I remember meeting him in Paris in 1920 on a bleak October day, and he and Mrs. Porter invited me to go on an inspection tour with them through the desolated fields, forests, and ruins. It was then that Porter told me of a thought which absorbed him, suggested by Bédier's book on the development of the mediaeval French epic along the pilgrimage roads. If the literature developed in this way, why not sculpture and architecture also? He followed the clue for years and in 1923 published his largest and probably his most important book, "Romanesque Sculpture of the Pilgrimage Roads," in ten volumes, one of text and nine of well chosen illustrations almost entirely from photographs taken by himself and Mrs. Porter, many of them unique and of great beauty.

He turned his attention to Greece, and he and Mrs. Porter went there for several months in 1923 to continue his researches in the field of Byzantine art in preparation for a course which he was to give at Harvard. Again in the summer of 1925 they went to Greece and chartered a Greek freight sloop and cruised among the Aegean Islands. On his return journey through Europe his valise was stolen. In it were the negatives of his photographs and a large part of his

notes. The world probably lost a valuable publication as a result of this theft.

His next book appeared in 1928. It was entitled "Spanish Romanesque Sculpture" and represented years of research in Spain. He showed that there had been a continuous development of sculpture in Europe, and called attention particularly to the pre-Romanesque sculpture of Spain and to the importance of some of the masterpieces of the eleventh century.

He was an indefatigable scholar. Eighty of his articles appeared in various periodicals and other collective works published in Europe and the United States. Most of these were on archaeological subjects, but some of them were essays and book reviews.

He was given honorary degrees and was made a member of ten learned societies in America, France, England, and Spain; and he received the Grande Médaille de Vermeil from the Société Française d'Archéologie for his book on "Lombard Architecture."

His enquiring mind was never content to settle into a groove of any sort, and he became fascinated with the idea of studying the part that Ireland played in the development of mediaeval art and its relation to Egypt, to Spain, and to the other countries of Europe. The Porters went to Ireland and he bought a demesne among the wild and romantic moors of Donegal. He was attracted in many ways to this austere and beautiful place, and not the least of its charm was that the traditional birthplace of Columcille was on his land. Here in Glenveagh Castle, a Victorian mansion, they entertained their friends including Irish scholars, artists, and poets. The Porters also built a cottage on the Island of Inishbofin off the north coast of Donegal. Miles away the lonely extent of the Atlantic was broken by the dim outline of the Island of Tory, which looked like a dream castle emerging from the northern sea.

In 1931 he published his last book, "The Crosses and Culture of Ireland," based on a series of lectures he had given at the Metropolitan Museum in New York. He consented to repeat these lectures at the Fogg Museum in the winter of 1929–30. Others had explored this field before him; but it is perhaps fair to say that no one had approached the subject with so wide a knowledge of the related fields of the mediaeval art in all the other countries of Europe.

In July, 1933, Mr. and Mrs. Porter went to spend a night at Inish-

bofin, where there are rocky cliffs and powerful tides. Next day there was a portentous thunderstorm and a heavy sea was running. By some cruel accident, the exact cause of which we shall probably never know, Mr. Porter fell to his death.

"When beggars die there are no comets seen,
The heavens themselves foretell the death of princes."

Kingsley Porter was a modest and somewhat shy person, tall and spare. He was a strong walker and swimmer. And when he was young he used to hunt big game during his vacations in Newfoundland and in Canada. It was remarked of him that it was unusual to see a scholar of such great industry and learning who was so much at home out of doors. He was friendly in a quiet way, though in general somewhat reserved. He had the rare combination of a poetical and scholarly nature with the capacity of a business man. He showed clear-headed intelligence and good judgment in handling his affairs.

He was brilliantly successful as a teacher. In his earlier years he gave some general courses at Yale; but later at Harvard he developed a style of teaching which was of a more intimate and congenial nature. Here he talked on the subjects so dear to his heart, to a group of a dozen students seated around a table. If more than twelve joined his class, he would repeat the lecture in two consecutive hours so that the photographic material could be properly seen and understood. He gave of his best to his students, and developed a group of disciples who are carrying on his work. He gathered together a collection of original works of art, an admirable library, and a valuable collection of photographs at Elmwood. These were placed at the disposal of his students for use in their studies. He was a good linguist and, besides the usual classical and modern European languages, including Spanish, he learned Catalan and Scandinavian; and even acquired a knowledge of the ancient Celtic language.

Professor Post says of him: "It was highly characteristic of Porter's mental curiosity and alertness that he should constantly have changed his basis of interest, partly because he so nearly exhausted the possibilities of each problem that he approached."

As an example of the incisiveness of his mind:—At a time when European archaeologists vaguely thought that the architecture and sculpture of the ruined Abbey of Cluny were of the twelfth century,

Porter divined that they were created in the eleventh century, and from this fact he was able to draw significant conclusions. Professor Kenneth Conant was able to prove later in the course of his excavations and researches that Porter was right.

Just before his death he was preparing a paper on pagan sculpture in Ireland, and this brought him to the threshold of the prehistoric age.

Thus his mind might be compared to a searchlight that flashed in one direction clearly illuminating that field, then turned its powerful light on another region, and then to still another, revealing to the world certain new aspects and the relation of these fields to each other as one by one they emerged from partial shadows.

Besides his monumental books which made his fame, and his great array of magazine articles, he published three other short books. In his series of essays entitled "Beyond Architecture," first published in 1918, he gives glimpses of his enthusiasm for the civilization of the thirteenth century, when the community created great works for the glory of God. He contrasts the wonders of that civilization with the often selfish passion for individualism, the intellectual laziness of our peoples, and the damage that the machine age has done to our aesthetic sense. "The Virgin and the Clerk," one of his short plays, was performed with success at the Carnegie Institute in Pittsburgh. The other play, "The Seven Who Slept," was based on an early legend. It produces a sense of aloofness and unearthliness. In "The Crosses and Culture of Ireland," which proved to be his farewell message, he gives a stimulating picture of the sunrise land of Egypt sending forth some of its thought and spirit to Ireland, where the sun sinks into the western waters. The Irish, he says, were probably the oldest race in Europe, unconquered by the Romans and keeping pure their primitive characteristics. He emphasizes the potency of the influence of the Irish monasteries which spread over Europe from the sixth to the ninth centuries. The poetical and mystical sagas set vibrating chords in his kindred nature, and he rejoiced in the early legends and visions of these dwellers by the sea.

EDWARD W. FORBES.

AUGUSTO RIGHI (1850–1920).

Foreign Honorary Member in Class I, Section 2, 1912.

Righi was born at Bologna August 27, 1850, and he died there June 8, 1920. Educated at the University of Bologna, he taught physics there for a time as a young man, became professor of physics at the University of Palermo in 1880 and at the University of Bologna in 1903, remaining in this position till his death. He was made a Senator in 1903.

He was probably the leading Italian of his generation in the field of pure physics. He was an active investigator and a skillful expositor of physical phenomena and laws.

In the early days of electromagnetic radiation development he invented an electric oscillator which was widely used for the production of Hertzian waves. It is said that Marconi as a young man visited the laboratory at Bologna and saw the radiation apparatus and experiments there, but it does not appear that he was ever a student under Righi in the regular way.

Righi worked a great deal experimentally on the phenomena produced by action of a magnetic field on various forms of the electric current. He, and Leduc independently, discovered one of the four "transverse effects" of the magnetic field, the production and maintenance of a temperature-gradient at right angles with the direction of heat-flow in a metal.

He won a 10,000 lire prize of the Accadèmia dei Lincei and the Hughes medal of the Royal Society of London, of which Society he was a foreign member. Sir Oliver Lodge, in Nature, vol. 105, p. 753, says that Righi succeeded Lord Kelvin as a foreign member of the Royal Academy of Science at Upsala.

In person Righi was both genial and impressive.

EDWIN H. HALL.

ARTHUR BLISS SEYMOUR[1] (1859–1933).

Fellow in Class II, Section 2, 1892.

Arthur Bliss Seymour, of New England Puritan stock on both sides of his family, was born January 3, 1859, at Moline, Illinois. His

[1] Compare the biography by L. R. Jones in Mycologia 26: 279–290. 1934. (Portrait, Bibliography and Exsiccati.)

father, a direct lineal descendant of a Richard Seymour who came from Hertfordshire, England to Hartford, Connecticut in 1639, had moved from Massachusetts to Illinois in 1853. He married Anna Julia Conkling of Champaign, Illinois in 1886. He died at Waverley, Massachusetts, on March 29, 1933.

Mr. Seymour was a naturalist, with plants as his main, absorbing interest. His education as a botanist began in boyhood under fortunate, informal tutelage amid the rich flora of the prairies of Illinois. His academic training in his beloved subject was carried out at the University of Illinois under the stimulating and markedly formative direction of a notable teacher and investigator, Professor Thomas J. Burrill, immediate associations with whom lasted from 1877 to 1883. Seymour was graduated from the University of Illinois in 1881 and received from the same institution the degree of Master of Science in 1886.

After a few years of service as botanist to the Illinois State Laboratory of Natural History, Mr. Seymour came to Harvard University in 1883 as assistant to Professor W. G. Farlow. He served in that capacity for two years, then taught in the University of Wisconsin for one year (1885–6), and in 1886 was called to Harvard University as assistant in the Cryptogamic Herbarium. There he continued to the end.

Mr. Seymour entered on what proved to be his major life work with rare enthusiasm, and to this abounding enthusiasm were added a kindly spirit and a persistent zeal that continued undiminished until death claimed him. The Cryptogamic Herbarium at the time he joined Professor Farlow was in its beginnings. He lived to see its rise to a foremost world position, and in its development he played a very important part. On him fell the responsibility of sorting out and making easily available the data on the rich collections being assembled by Professor Farlow and simultaneously building up a complete catalogue of bibliographical references covering the rapidly expanding field of American mycology. This was a prodigious undertaking and successful accomplishment called for adequate training, a workable system, an unusual aptitude, and exacting faithfulness. Model, surprisingly complete indexes are a heritage of his labors—magnificent contributions of permanent value to botanical science.

Based on these indexes, three great works have been issued from

the Farlow Herbarium, namely,—"A provisional host index of the fungi of the United States" (1888–1891) (Farlow and Seymour); "Bibliographical index of North American fungi" volume I, part 1 (1905) (Farlow); and "Host index of the fungi of North America" (1929) (Seymour). The indexes, indispensable as they are to mycology, are being continued. They will ever remain a monument to the memories of Professor W. G. Farlow and Mr. A. B. Seymour.

J. H. FAULL.

SAMUEL WESLEY STRATTON (1861–1931).

Fellow in Class I, Section 4, 1923.

Samuel Wesley Stratton, internationally known as the creator of the Bureau of Standards, was born on a farm at Litchfield, Illinois, on July 18, 1861. He was the son of Samuel and Mary B. (Webster) Stratton, and on the paternal side his lineage is traced to the early settlers of Virginia. The son early shared in the farm labor, and here acquired the habits of hard work and intensive study of his tasks. From boyhood he showed the keenest interest in mechanics, and he found enjoyment in maintaining the machinery of the farm in perfect condition, and in contriving mechanical inventions to make easier the many home labors which a varied farm life demands.

He attended the district school and later the limited village "high" school in his native township. His youthful ambition was to become a thorough machinist. Even at this time neighboring farmers recognized his skill and sought his help.

Through his step-brother he learned of the mechanical shops at the new Illinois Industrial University (now the University of Illinois), where students could earn a part of their school expenses. Greatly desiring such an opportunity, he induced his father to permit him to attend for a single year. Before doing so he worked for nearly two years to earn the needed money, and in 1880 began his college life as a special student at Urbana. After a few months at the university he was convinced that engineering must be his life work. He earned his way from year to year, at the same time carrying extra courses, and completed with distinction his course for the S.B. degree in Mechanical Engineering in the Class of 1884. He later returned to Urbana as Instructor in Physics and Mathematics, but soon confined

his work to physics alone, and in 1890 was designated to establish and take charge of a new course in Electrical Engineering. For the next two years he was Professor of Electrical Engineering.

In 1892, he was elected associate professor of physics at the newly organized University of Chicago. Here he became associated with Michelson in his investigations on the speed of light, and also gave much attention to the applications of physics to engineering. In addition, he planned and supervised construction of the Ryerson Laboratories.

Always interested in military affairs, he joined the Naval Militia and in 1898, at the outbreak of war with Spain, held the position of commander. With the rank of Lieutenant, he entered the naval service, his unit being assigned to the "Texas." He saw at once the need for standardization of equipment for war vessels, and prepared a brief report thereon.

Two years later, in 1900, he was asked by Secretary of the Treasury, Lyman J. Gage, to prepare a report for a national Bureau of Standards. A bill, authorizing the establishment of the Bureau resulted and was presented to Congress. Dr. Stratton skillfully managed the many hearings and demonstrations before the congressional committee, and the bill was passed on March 3, 1901. The Bureau of Standards thus became an actuality. On the insistence of Secretary Gage, Dr. Stratton became its first Director. His vision of the usefulness and functions of such a Bureau was so clear that from the beginning the work of the Bureau expanded greatly.

In 1903 the Bureau was transferred to the Department of Commerce, extending the opportunity to bring research directly to the aid of commerce and industry. Under his broad minded direction invaluable service was given to a great number of industries. He had the gift of securing first the confidence and then the cooperation of industrial leaders and men of vision in many technical fields. Dr. Stratton and the Bureau promptly became important factors in the International Conference on Weights and Measures, and in manifold advisory committees for industry. Under his direction the Bureau grew to one of the great research centers of America.

With the advent of the World War invaluable service was rendered. As an outstanding example, his work on optical glass, in coöperation with American manufacturers, made possible glass of superior quality and rendered American industry independent of foreign sources.

Dr. Stratton never lost interest in technical education, and when he was invited to become the President of the Institute of Technology in 1923 he accepted, in the belief that here he could render a special service both to the Institute because of his knowledge of the needs of industry, and to American industry by participating actively in the training of men of the type who would become the leaders in the industrial fields. He believed firmly in sound engineering training combined with the appreciation of research. His interest in the problems of student life and welfare at Technology found expression in his part in securing a new infirmary with adequate physical examinations and medical supervision, new dormitories with modern conveniences for comfort and hygienic living and a high social standard, and emphasis on human relations in business and industry.

For many years the position of President of the Institute had made exacting and almost impossible demands on the energies of its incumbent. In 1930 a reorganization of administrative policy was effected, whereby Dr. Stratton became Chairman of the Corporation, and Dr. K. T. Compton was elected to the office of President. Thus, two men shared the responsibilities which one had always borne hitherto. This harmonious arrangement was of brief duration, however, for Dr. Stratton died instantly on October 18, 1931, while in the very act of dictating a warm eulogy of his friend Edison, who had died earlier the same day.

Outwardly reserved, and often unassertive to the point of shyness, Dr. Stratton had innate qualities that greatly endeared him to those fortunate enough to know him well. His great modesty, his generosity and the desire to give rather than take credit were strongly developed. In his own home one saw the man at his best, for he was the perfect host. Associates and guests who penetrated his natural reserve readily became steadfast admirers, finding him always a man of strong personality, of forceful and unimpeachable character, and of unswerving loyalty. They also discovered hidden depths of sentiment and an immeasurable fount of specialized knowledge and interests in many fields. He was versed in textiles, china, glass, and antique furniture, as well as mechanical devices of every sort and the latest technical advances in physics and engineering. In his rare hours of freedom from administrative duties, he found particular enjoyment in constructing with his own hands pieces of scientific apparatus or in

building cabinets or furniture. Whether working with wood or metal his technique and attention to detail were meticulous and faultless. In this avocation he not only found relief from the greater problems and cares incident to his office, but his work expressed that striving for exactness and high quality, even to perfection, which characterized his life.

His memberships included not only this Academy, the National Academy of Sciences, the American Philosophical Society, and the great engineering societies, but he was also Chairman of the International Conference on Weights and Measures, and a chevalier and an officer of the Legion of Honor.

Many honors came to him from universities at home and abroad, including the Dr.Eng. from the University of Illinois, his *alma mater;* D.Sc. from the University of Pittsburgh, Cambridge, and Yale; Ph.D. from Rensselaer; and LL.D. from Harvard. Among other distinctions, he was awarded the Cresson Medal of the Franklin Institute and the Public Service Medal of the National Academy.

He was great not only in his desire to serve his people and in scientific achievement, but in character and loyalty to his friends.

SAMUEL C. PRESCOTT.

GEORGE FILLMORE SWAIN[1] (1857–1931).

Fellow in Class I, Section 4, 1888.

George Fillmore Swain, whose death occurred at his home on July 1, 1931, was distinguished as an educator, an engineer, and a public servant. He was born in California on March 2, 1857. His ancestors came from New England and he, himself, came to Boston as a student at the Massachusetts Institute of Technology, from which he was graduated in 1877. In 1877–1880 he was a student at the Royal Polytechnic School in Berlin and then returned to Boston, where he lived until his death.

His first professional duties were as a Special United States Census Agent upon the investigation of water power along the Atlantic slope for the 1880 census. This work was followed by brief engagements in hydraulic engineering at Lowell and Lawrence. General Francis A.

[1] Further details of Professor Swain's life are given in the Memoir by C. Frank Allen, Proceedings of the Boston Society of Civil Engineers. June, 1932.

Walker, the Director of the Census, during Swain's service, was appointed President of the Massachusetts Institute of Technology in 1881, and soon after his appointment selected Swain as an instructor in Civil Engineering. He served in this position but a brief time and was then appointed an Assistant Professor. Upon the retirement of Professor Vose, he was, in 1887, at the early age of 30, appointed Hayward Professor of Civil Engineering.

The failure of the Bussey Bridge in Roslindale in 1887 and Professor Swain's clear analysis of the cause, proved conclusively his outstanding ability in the field of engineering and led to his appointment by the Massachusetts Railroad Commission as its first expert engineer, which position he filled for many years in conjunction with his Technology professorship. His duties for the Railroad Commission included inspection of existing railroad bridges and approval of plans of new bridges throughout the state. The experience thus gained was reflected in his teaching, giving him an authoritative standing in the theory and practice of bridge engineering and establishing him at an early age as one of the outstanding engineering teachers of the country, a standing which he maintained until his retirement from active teaching.

Opportunity for another public service came to him in 1894 through his appointment to the newly organized Boston Transit Commission, upon which he served for twenty-five years, the last five years as Chairman. The pioneer work of this Commission in building the first electric railway subway in this country was notable and towards this he contributed an important part.

It would seem as if the duties of these various fixed positions would have occupied his full time and energy, but his strong power of concentration, clear thinking and confidence in the soundness of his reasoning and conclusions enabled him to make notable successes, not only in all of these fields, but also in numerous miscellaneous engineering projects in which he participated.

In 1909 he resigned from the Massachusetts Institute of Technology to accept appointment at Harvard as the first Gordon McKay Professor of Civil Engineering, where he continued his active teaching until his retirement as Professor Emeritus in 1929.

One of the rewards of success in any professional field is the recognition of one's associates and this was given Professor Swain in

liberal measure. He early served a term as president of the Boston Society of Civil Engineers and in 1913 was elected for the usual one-year term as President of the American Society of Civil Engineers, the oldest of the national engineering societies on this continent. To both of these societies he contributed liberally through his papers and personal services and was later elected as an honorary member of each.

New York University conferred upon him the honorary degree of LL.D. in 1906 and the University of California gave him the same degree in 1918. In 1928 he was the first recipient of the Lamme Medal given by the Society for the Promotion of Engineering Education for "accomplishment in technical teaching or actual advancement in the art of technical training."

Perhaps the most notable factor in Dr. Swain's teaching was his ability to reduce apparently complicated problems to terms so simple as to be easily understood by the ordinary student. The application of complicated mathematical formulas to the solution of simple structural problems, which was common in the earlier treatises on the subject of bridge engineering, always impressed him as unnecessary and convinced him that the authors did not really understand the topics which they were presenting.

While not a voluminous writer, he contributed to engineering journals numerous papers of high importance in the field of structural engineering and in the latter part of his life began a treatise in four volumes dealing with structures and materials, of which three volumes alone were published, his final illness preventing the completion of this important work.

CHARLES M. SPOFFORD.

JOHN ELIOT THAYER (1862–1933).

Fellow in Class II, Section 3, 1912.

The town of Lancaster, Mass. runs mostly along a single street for a mile or more and in its southern part stands the beautiful Thayer Museum of Ornithology, where John Thayer's huge collection of North American Birds was housed.

In a part of the world where rural centers long ago lost their cultured leaders and much of the old social tradition, John Thayer stands out as the finest example of what a New England country gentleman

ought to be. Indeed I can think of no other alive today who is filling quite the same niche that he did.

People of means now identify themselves almost wholly with city life and city interests, migrating to the country for short summer seasons, but John fixed upon Lancaster and his bird collections as almost his sole interests. In Lancaster he could be found winter and summer, in fair weather or foul, at his home on George Hill Road, and his fellow townsmen knew that in case of need his genial spirit would not fail them. He despised the city. In several places in his little diary of winter bird notes appear remarks such as this: "Had to go to Boston, how I hate it."

John Eliot Thayer was born in Boston in April 1862 and died in Lancaster July 22, 1933. His grandfather, Reverend Nathaniel Thayer, came to Lancaster from Hampton, New Hampshire, and began preaching there in 1792.

John graduated from the Hopkinson School in Boston and from Harvard with the class of 1885. He was first marshall of his class and one of its most popular members. He was given an honorary A.M. from Harvard in 1910. He married Miss Evelyn Duncan Forbes in 1886 and soon after, in 1888, moved into the large cheerful house on George Hill Road where with his family he spent the best part of his life. He is survived by Mrs. Thayer and five children, all married.

It seems rather odd to find that John was not actively interested in birds when he was a boy. I daresay he went through the usual stages of nest and egg collecting, but he seems to have dropped that interest and not to have taken it up again for some time. During his college period he, with his brother Bayard, maintained large kennels on George Hill Road where they raised fox terriers, deer hounds, and old-fashioned English bull dogs.

Next followed an absorbing interest in horses, which lasted through the middle nineties. In 1892 he bought the famous trotting stallion, Ralph Wilkes (2.06¾) who died in 1895. Then followed a stallion named Electricity (2.17¾). After this he purchased Baron Wilkes from a Kentucky breeder, reported at that time as the greatest living son of the renowned George Wilkes. At this time he was President of the New England Trotting Horse Breeders' Association and of the Worcester East Agriculture Society. In the late nineties John turned from horses to his permanent interest in birds.

At first his aim in ornithology was chiefly to get together a collection of all the local birds and he paid special attention to nests and eggs. Soon, however, his interest broadened so as to include the whole of North America. His collections were at first housed in several wooden buildings close to his house, but when these became unsafe and crowded he built the beautiful brick building in the town of South Lancaster and opened it to the public in November 1904.

In the visitors' book of the Thayer Museum appear the names of nearly all the ornithologists of the time, and it is interesting to note that, in spite of the fact that Lancaster thirty years ago was rather far off the beaten path, more than ten thousand visitors came to the museum in the first six years. After that, no tally seems to have been kept.

From now on John strove in every way to make his collections as complete as possible with large series of beautifully prepared specimens. He sent out collectors to Alaska, North Eastern Siberia, the Queen Charlotte Islands, Lower California, and Northern Mexico. In 1931 the whole of this collection was given to the Museum of Comparative Zoology at Harvard, but it is to be hoped that the Lancaster Museum, with at least a synoptic collection of mounted birds, will remain as a memorial to his enthusiasm. His library of ornithology was kept in his house, all save a few working books. This was sold and dispersed in 1931.

He had been an Associate of the American Ornithologists' Union since 1898 and was elected a member in 1905. All his important contributions were published with Outram Bangs as co-author. Among these may be mentioned the following:

Vertebrata of Gorgona Isle, Columbia; Aves, Bul. M. C. Z., **46**, no. 5, 1905.

Mammals and Birds of the Pearl Isles, Bay of Panama; Bul. M. C. Z., **46**, no. 8, 1905.

Vertebrata from the Savana of Panama; Aves, Bul. M. C. Z., **46**, no. 12, 1906.

Catalogue of Birds collected by W. W. Brown, Jr. in Middle Lower Calif.; Condor, **9**, no. 5, 1907.

Descriptions of New Birds from Central China; Bul. M. C. Z., **52**, no. 8, 1909.

Aves from Szechwan, Memoirs M. C. Z., **40**, no. 4, 1912.

Notes on the Birds of the Arctic Coast of East Siberia; Proc. New Eng. Zool. Club, **5**, 1914.

And now a few words as to the real John Thayer. You felt rather than saw his easy, beaming presence almost before you were aware that anyone else was in the room. His simplicity and directness, rarest of human attributes, were almost childlike, but they served to put any group of people immediately at ease. It was not what John said or did at a meeting, for he was far too modest to trumpet his own views; it was his comfortable presence that gave us all a sense of well-being.

He almost never traveled, and he never went on an ornithological collecting trip. Once when a youth he went to Europe and this, with several early journeys to the West and to Mexico, seem to have satisfied any slight curiosity for sight-seeing that he may have had. In one place in his winter bird diary he says, under March 17: "Off for Florida for two weeks. This is a mistake for the weather here (Lancaster) is like summer and what more can anyone ask?"

The winter and early spring birds seen around his orchards and at his feeding boxes gave him the keenest possible pleasure and these with his ever growing family (he could boast of eighteen grandchildren before he died), as well as positions in town, church, and library, and in his beloved museum, kept him busy every day of the year.

John enjoyed robust health up to the time of his severe illness early in 1928. His stocky athletic figure was full of energy, as the following quotation taken from his diary of July 22, 1926, when he was sixty-four years old, will prove. "Temperature 103°, the hottest day to date in the history of Boston. I worked all day in my orchard thinning apples. It was 100° in the shade of my house. I dismissed my help at four o'clock, but worked myself until six. Pretty good for an old fellow."

No notice of John Thayer's life would be complete without some reference to the positions of trust which he filled in Lancaster and elsewhere. He was the oldest Vice-President in point of service in the Massachusetts Forest and Park Association (Vice-President for Worcester County since 1908). He was also for many years a trustee of that ancient "Massachusetts Society for promoting agriculture," dating back to the eighteenth century. He served for at least ten years on the Executive Committee of the Massachusetts Fish and Game Association. He held the position of tree warden of Lancaster

ever since the State Tree Warden law went into effect in 1901. But that was not the beginning of his active interest in trees, for in his first report he says "For the last ten years, as a member of the Road Commission, I have taken this department under my care, so that in reality we have had a tree warden for a good many years."

As a member of the Board of Trustees of the Lancaster Town Library, he served from 1888 to 1933, without doubt the longest individual membership on any board in the town. But this is not the most important, for as the resolution upon his death says, it was his regularity of attendance, his generosity, tact, and cheerfulness that made his long service so noteworthy. As a trustee of the Clinton Hospital Association, as a Selectman of his own town for thirty years, as President of the Lancastriana Society, and as benefactor of his local church his memory will last for many years. During the War he served on the draft board of Division 14 for Clinton, Leominster, and Lancaster, financing the office work entirely from his own pocket. It would be impossible to list or even hint at his benefactions, save to say that after attending to charities at home in Lancaster, as was fitting, his name was found whenever worthwhile philanthropy asked for aid. But chiefly, his interests were in the domain of agriculture, horticulture, conservation, and the study of birds.

And so we must leave him, safe in the knowledge that his rare qualities will be perpetuated in the character of his descendants and in the hearts of his friends. He was in very fact the first and probably the last "John of Lancaster."

JOHN C. PHILLIPS.

WILLIAM CAWTHORNE UNWIN[1] (1838–1933).

Foreign Honorary Member in Class I, Section 4, 1900

Unwin was born at Coggeshall, Essex, England, on December 12, 1838. He was brought up in an academic atmosphere, his father being principal of Homerton College. At the age of eighteen he was apprenticed to the engineer, Sir William Fairbairn. He there had training in research problems, and by study at night he obtained the degree of B.Sc. at the University of London in 1860.

[1] The following notice is abstracted from an obituary published in *Nature*, Volume CXXXI, May 13, 1933, pages 681–682.

In 1862 he became manager at the works of Messrs. Williams at Kendal, where the manufacture of Thomson's new vortex turbine had been begun; and in 1867 he was made manager of the engine department of the Fairbairn Engineering Company. In 1868 he began his teaching career as instructor in marine engineering in the Royal School of Naval Architecture; and in 1872 he was appointed professor of hydraulics and mechanical engineering at the Royal Indian Engineering College, Coopers Hill, which position he held until 1884.

In 1877 he published his textbook on *The Elements of Machine Design*, which had a wide use. In 1884 he was appointed professor of civil and mechanical engineering in the newly established City and Guilds Central Technical College, where he became associated with Armstrong, Henrici, and Ayrton.

In 1890 an American company appointed an international commission of five experts under the presidency of Lord Kelvin (then Sir William Thomson) to determine the best way of developing the power of Niagara and distributing it. The headquarters of this commission were at the Central College, and Unwin was secretary. In this service he made several trips to Niagara to study the conditions of the problem on the ground. He also carried out a long research on the flow of tidal waters in the Thames with reference especially to the pollution of the upper waters from the sewage of the London main outfalls.

In 1904 Unwin resigned his professorship but continued his engineering practice. He was on the council of the Institution of Civil Engineers, and took part in framing the new proposals relating to the preliminary training of the civil engineer. In 1911 he was elected president of the Institution and in 1915 elected president of the Institution of Mechanical Engineers and again in 1916.

During the war, at the age of seventy-seven, he served on the management board of the Metropolitan Munitions Committee.

He was awarded the Kelvin medal, was a fellow of the Royal Society, LL.D. of Edinburgh, honorary member of both American Societies of Civil Engineers and Mechanical Engineers, and an honorary associate of the Royal Institute of British Architects.

JOHAN HERMAN LIE VOGT (1858–1932).

Foreign Honorary Member in Class II, Section 1, 1915.

Johan Herman Lie Vogt was a pioneer in the scientific study of ores that have been deposited directly from molten rock. He was the first to apply the principles of physical chemistry to the genetic questions about these important ores, and, in so doing, greatly stimulated fruitful research on the origin of rock species in general.

Vogt was born on October 14, 1858, at Tvedestrand, Norway, and died at Trondhjem on January 3, 1932. His training as a geologist began in 1876 in Saxony, where Werner, one of the fathers of geology, and afterwards a great number of eminent mineralogists and geologists, from Von Humboldt, Von Buch, Breithaupt, Mohs, and Naumann to Brush, Pumpelly, Emmons, Hague, and Lindgren, studied or taught. In 1880 Vogt won the degree of mining engineer at Oslo and then, at the universities of Stockholm and Paris, further prepared himself for leadership. At the age of twenty-eight he was appointed a professor at the University of Oslo, whence, in 1912, he went to the Technological Institute at Trondhjem as Professor of Geology and Metallurgy. From this position he retired in 1929.

In order to secure first-hand knowledge of the facts relating to his intricate subject, Vogt visited mines and mineral deposits all over Scandinavia and in most of the other countries of Europe. He enriched such experience by field work for the Geological Survey of Norway. But he saw that solutions to his many problems of origin could not be found in field observations taken alone; he early concluded that experiment could throw a flood of light on his great subject. With remarkable insight he used the precise, quantitative data derived from the slags of metallurgical establishments to discover the physico-chemical laws controlling the voluminous silicate melts or magmas from which oxide, sulphide, and other ore bodies in Nature have been derived. His many monographs detailing his results illustrate his passion for accuracy in observation and reasoning, and will long remain classics in the science of rocks. The number of his published writings totals more than two hundred.

Vogt's power and high achievement were specially recognized by many scientific institutions. He was given an honorary doctor's degree by the Institute of Technology at Aachen. He was elected a member in each of the scientific academies of Oslo, Trondhjem,

Stockholm, Copenhagen, Leningrad, Germany (Deutsche Akademie der Naturforscher), as well as our own Academy of Arts and Sciences. He became honorary member of the Geological Society of London and of the Geological Society of America—each election representing a rare distinction. In 1929 the American Society of Economic Geologists voted him their Penrose gold medal, which is awarded only to first-rank masters in the field of ore deposits. These were some of the honors that came to our colleague and fellow member.

REGINALD A. DALY.

WILLIAM HULTZ WALKER (1869–1934).

Fellow in Class I, Section 3, 1907.

William H. Walker died of a heart attack on July 9, 1934 while driving his car from Bridgton, Maine, to Boston. His loss is a severe blow to the host of men whom he helped and guided during his active life as an educator, an executive, a chemist, and an engineer.

As an educator, he pioneered both in the laying of the foundations for chemical engineering and in the development of the education of chemical engineers. His students will remember best his wonderful friendliness, his insistence upon the value of initiative and personality, and on accuracy and vigor in the presentation of ideas, as well as scientific attainment. Above all, he insisted that conclusions must be based upon factual evidence and that no work is complete until the phenomena involved are so fully understood that the separate variables stand out by themselves and the whole picture can be explained in simple, concise language.

Dr. Walker was born at Pittsburgh, Pennsylvania, the son of David H. and Anna Blair Walker, on April 7, 1869. After graduating from the Pennsylvania State College, he took his doctor's degree in chemistry at the University of Goettingen. In 1894 he taught analytical chemistry at the Massachusetts Institute of Technology.

In 1900 he joined in partnership with Dr. Arthur D. Little to carry on the application of chemistry and physics to industry. In spite of the success which attended the partnership, Dr. Walker could not refuse the call of education and in a few years returned to teaching at the Massachusetts Institute of Technology. He felt that, although needing men well grounded in chemistry and in engineering, chemical

engineering was a profession in itself. He insisted that the demand of industry for men trained to accomplish what the existing staffs of process-industry had not yet been able to do, could not adequately be met by teaching a little engineering to chemists or a little chemistry to mechanical engineers.

Throughout he believed that an educator of engineers should have constant everyday contacts with the industries which his students were to serve. In 1906 he was appointed a special lecturer on industrial chemistry at Harvard University. Here he developed a course along his own ideas and, though he found that the demands on his time were too great to let him continue with it, the few years that he gave to this course attracted many men who later studied chemical engineering.

In 1915, he felt with Dr. Little that the development of chemical engineering necessitated the training of more men equipped for specialized research in this field. With the aid of Dr. Little, there was obtained for Technology from Mr. George Eastman an endowment which permitted him to organize, as a corollary to the teaching of chemical engineering, the Graduate School of Chemical Engineering Practice at the Institute. This same point of view had previously led to the establishment of the Research Laboratory of Applied Chemistry. This Laboratory was so successful that it obtained from its industrial contacts the funds with which to support many of the "*pro bono publico*" researches for the development of some of the fundamental laws of chemical engineering. It has contributed to the knowledge of the mechanisms of the corrosion of iron and steel; contributions which, invaluable as they are to society, are a monument to Walker. These efforts brought chemical engineering to a point where in 1923, in collaboration with two of his former students, Warren K. Lewis and William H. MacAdams, he wrote an outstanding pioneering book of the profession, "The Principles of Chemical Engineering."

Almost at the start of this country's entrance into the World War, he was called to Washington to help with various problems incident to chemical warfare. As Colonel in the Chemical Warfare Service, he was placed first in charge of the completion and organization of Edgewood Arsenal and later of the entire Gas Offense Division of the Chemical Warfare Service. The organization which he took over was badly disrupted by the petty jealousies and uncertainties incident to

reorganizations and the making of a full fledged service from what had been at the start an "orphan child" of the Ordinance Department. The difficulties which he encountered and surmounted and his successes are a chapter in themselves. When he left the Service at the end of the War, the Distinguished Service Medal, which he received for his achievements, had been obtained at the expense of irreparable damage to his constitution.

In the spring of 1919 he returned to the Massachusetts Institute of Technology full of plans and hopes for the further development of the Department of Chemical Engineering, the School of Chemical Engineering Practice, and the Research Laboratory of Industrial Chemistry, all three of which he headed. However, his enjoyment of this prospect was but short-lived. In January of the next year he was persuaded by President MacLaurin to undertake as a labor of love for the Institute the work of financing and organizing the Division of Industrial Cooperation and Research. Upon the death of President MacLaurin he was made a member of the Administrative Committee of the Institute but, as his health was impaired, he soon retired with the thought that he would lead a comparatively inactive life and carry on but a desultory specialized consulting practice. However, he no sooner had recovered from a severe operation and regained his health than he was swamped by demands upon his time. Up to the very end, he was active as a consultant, often in connection with large patent litigations, where his keen and analytic reasoning allowed him to present complex situations, but little understood by many technical men, so clearly that they were readily understood by laymen and jurists.

He was identified with many scientific organizations and contributed frequently to the scientific literature. He was Vice-President of the International Congress of Applied Chemistry in Berlin in 1893, was President of the Electro-Chemical Society in 1910, and was awarded the Nichols Medal in 1908. He was also an active member of the Committee of the American Chemical Society to cooperate with the Chemical Warfare Service, a non-resident professor of chemical engineering, a member of the Visiting Committee of the Department of Chemical Engineering at the Massachusetts Institute of Technology, and a director of Dewey and Almy Chemical Company.

Of late years he maintained a winter home in Pasadena, California,

and a summer residence at Bridgton, Maine. He is survived by his widow, Isabelle Luther Walker, and his son, Jonathan L. Walker, of Los Angeles.

BRADLEY DEWEY.[1]

ROBERT DE COURCY WARD (1867–1931).

Fellow in Class II, Section 1, 1898.

Many years ago there was a meeting of a certain Club at the home of Professor and Mrs. Robert De Courcy Ward in Cambridge. After some routine matters had been disposed of, the host, as essayist of the evening, read a paper on Climate in the Eastern part of the United States and its effect on personal character. The paper had been carefully prepared and the speaker was listened to with interest. When it was finished and discussion was in order, one of the company arose and after stating his own views at considerable length proceeded to criticize the figures given and whether he meant it or not, his remarks were unfavorable to Professor Ward. The group sat in mute astonishment. Then the writer rose and perhaps with more heat than was necessary proceeded to prove that the figures were authentic, that the second speaker was in dense ignorance of certain matters, and that Professor Ward was the leading climatologist in our country. For a long time after the meeting, comments of a congratulatory nature reached him. Ward was then just coming into prominence for his researches in climatic matters. Climatology was indeed his first and chief vocation. He had many classes at Harvard and his lectures upheld the high scholarship of his predecessor Professor William M. Davis. He had served as Assistant for many years, some of the time without pay, and one might note much of the ways and methods of the earlier instructor in his lectures. Outside the lecture room there stood a large case filled with carefully indexed copies of the various papers sent to him from all parts of the world. Once when looking over the case, and somewhat regretful of the time he had been forced to spend on it, he offered to bequeath it to the writer; but only to have the generous offer declined for the simple reason that the writer was himself overburdened with like matter.

[1] Slightly condensed from a notice in *Nucleus*, N. E. Sect. Amer. Chem. Soc., Nov. 1934.

The number of papers that Ward handled was tremendous. And he was familiar with the contents of each one. Some of his classes were very large and in later years he required several assistants. He was a competent instructor, speaking clearly and easily. It was evident that he knew whereof he was talking. He also had some classes at Radcliffe.

The Control of Immigration was his avocation and he wrote and spoke concerning the character of immigrants and the need of limiting the quotas. In this he was successful and his views were appreciated and acted upon by those in authority.

At the College, he was one of the prominent members of the Committee on Instruction and later on Admission. He seldom missed any of the meetings, and this work required much time. He was careful in scrutinizing the work of candidates and never hesitated to express his views on the various matters that would arise. He held the chair of Climatology at Harvard for twenty-one years. In his earlier days he was Editor of the American Meteorological Magazine, one of the contributing Editors of the Geographical Magazine (continued until his death) and one of the writers on the Encyclopedia Britannica. He was the author of several books, the best known of which are "Climate in Relation to Man" and the "Climates of the United States." His translation of Hann's work is also widely known. He was a member of the American Academy of Arts and Sciences, the Royal Meteorological Society, the Association of American Geographers, the American Philosophical Society, the American Geographical Society and other learned bodies.

He married Miss Emma Lane of St. Louis, Missouri, in April 1897 and their home life with four children, two boys and two girls, was most happy. His wife died shortly after his death.

ALEXANDER MCADIE.

American Academy of Arts and Sciences.

OFFICERS AND COMMITTEES FOR 1934–1935.

PRESIDENT.

GEORGE HOWARD PARKER.

VICE-PRESIDENTS.

Class I.
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Robert Spurr Weston . . . . . Brookline
Frank Edward Winsor . . . . . West Newton
Joseph Ruggles Worcester . . . . . Waltham

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Wallace Walter Atwood . . . . . Worcester
Norman Levi Bowen . . . . . Washington, D. C.
Isaiah Bowman . . . . . New York, N. Y.
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Kirk Bryan . . . . . Cambridge
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Percy Rogers Howe . . . . . Belmont
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Reid Hunt . . . . . Boston
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Leroy Matthew Simpson Miner. . . . . Newtonville
George Richards Minot . . . . . Brookline
William Lorenzo Moss . . . . . Augusta, Ga.
John Howard Mueller . . . . . Boston
Robert Bayley Osgood . . . . . Boston
Joseph Hershey Pratt . . . . . Boston
William Carter Quinby . . . . . Brookline
Milton Joseph Rosenau . . . . . Brookline
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Andrew Watson Sellards . . . . . Boston
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William Richards Castle, Jr. . . . . Washington, D. C.
Joseph Perkins Chamberlain . . . . . New York, N. Y.
Robert Treat Crane . . . . . New York, N. Y.
Sidney Bradshaw Fay . . . . . Cambridge
William Cameron Forbes . . . . . Norwood
Edgar Stephenson Furniss . . . . . New Haven, Conn.
Joseph Clark Grew . . . . . Tokyo, Japan
Albert Bushnell Hart . . . . . Cambridge
Arthur Norman Holcombe . . . . . Cambridge
Manley Ottmer Hudson . . . . . Cambridge
Philip Carryl Jessup . . . . . New York, N. Y.
Abbott Lawrence Lowell . . . . . Boston
William MacDonald . . . . . New York, N. Y.
Charles Edward Merriam . . . . . Chicago, Ill.
Ogden Livingston Mills . . . . . New York, N. Y.
John Bassett Moore . . . . . New York, N. Y.
William Bennett Munro . . . . . Pasadena, Cal.
Westal Woodbury Willoughby . . . . . Washington, D. C.
William Franklin Willoughby . . . . . Washington, D. C.
George Grafton Wilson . . . . . Cambridge
Quincy Wright . . . . . Chicago, Ill.
Henry Aaron Yeomans . . . . . Cambridge

CLASS III., SECTION III.—*Economics and Sociology.*—53.

Charles Jesse Bullock . . . . . Cambridge
Harold Hitchings Burbank . . . . . Cambridge
Richard Clarke Cabot . . . . . Cambridge
Thomas Nixon Carver . . . . . Cambridge
John Bates Clark . . . . . New York, N. Y.

John Maurice Clark . . . . . Westport, Conn.
Arthur Harrison Cole. . . . . Cambridge
Melvin Thomas Copeland . . . . . Cambridge
William Leonard Crum . . . . . Cambridge
William James Cunningham. . . . . Cambridge
Winthrop More Daniels . . . . . New Haven, Conn.
Clive Day . . . . . New Haven, Conn.
Davis Rich Dewey . . . . . Cambridge
Arthur Stone Dewing. . . . . Newton
Wallace Brett Donham . . . . . Boston
John Franklin Ebersole . . . . . Belmont
Irving Fisher . . . . . New Haven, Conn.
James Ford . . . . . Cambridge
Ralph Evans Freeman . . . . . Cambridge
Edwin Francis Gay . . . . . Cambridge
Sheldon Glueck . . . . . Cambridge
Robert Murray Haig . . . . . New York, N. Y.
Henry Wyman Holmes . . . . . Cambridge
Edwin Walter Kemmerer . . . . . Princeton, N. J.
Frank Hyneman Knight . . . . . Chicago, Ill.
Robert Morison MacIver . . . . . New York, N. Y.
Walter Wallace McLaren . . . . . Williamstown
Leon Carroll Marshall . . . . . Washington, D. C.
Edward Sagendorph Mason . . . . . Cambridge
Richard Stockton Meriam . . . . . South Lincoln
Harry Alvin Millis . . . . . Washington, D. C.
Frederick Cecil Mills . . . . . New York, N. Y.
Wesley Clair Mitchell . . . . . New York, N. Y.
Arthur Eli Monroe .. . . . . Cambridge
Harold Glenn Moulton . . . . . Washington, D. C.
Edwin Griswold Nourse . . . . . Washington, D. C.
William Fielding Ogburn. . . . . Chicago, Ill.
Robert Ezra Park. . . . . Chicago, Ill.
Warren Milton Persons . . . . . New York, N. Y.
Leo S. Rowe . . . . . Washington, D. C.
Josef Alois Schumpeter . . . . . Cambridge
Carl Snyder . . . . . New York, N. Y.
Pitirim Alexandrovich Sorokin . . . . . Winchester

Oliver Mitchell Wentworth Sprague . . . . . Cambridge
Frank William Taussig . . . . . Cambridge
Frederick John Teggart . . . . . Berkeley, Cal.
William Isaac Thomas . . . . . New York, N. Y.
Donald Skeele Tucker . . . . . Cambridge
Abbott Payson Usher . . . . . Belmont
Jacob Viner . . . . . Washington, D. C.
John Henry Williams . . . . . Cambridge
Leo Wolman . . . . . Washington, D. C.
Carle Clark Zimmerman . . . . . Winchester

CLASS III., SECTION IV.—*Administration and Affairs.*—28.

Charles Francis Adams . . . . . Concord
Charles Foster Batchelder . . . . . Cambridge
George Hoyt Bigelow . . . . . Milton
Ingersoll Bowditch . . . . . Jamaica Plain
John Albert Cousens . . . . . Tufts College
Henry Sturgis Dennison . . . . . Framingham
William Lusk Webster Field . . . . . Milton
Frank Johnson Goodnow . . . . . Baltimore, Md.
Francis Russell Hart . . . . . Boston
Edward Jackson Holmes . . . . . Boston
Matt Bushnell Jones . . . . . Newton Center
Henry Plimpton Kendall . . . . . Walpole
Nathaniel Thayer Kidder . . . . . Milton
Thomas William Lamont . . . . . New York, N. Y.
Clarence Cook Little . . . . . Bar Harbor, Me.
James Vance May . . . . . Boston
Thomas Nelson Perkins . . . . . Westwood
Andrew James Peters . . . . . Jamaica Plain
Herbert Putnam . . . . . Washington, D. C.
Alfred Lawrence Ripley . . . . . Andover
Erwin Haskell Schell . . . . . Cambridge
Jeremiah Smith, Jr. . . . . Cambridge
Payson Smith . . . . . Brookline
Albert Warren Stearns . . . . . Billerica
Charles Henry Taylor . . . . . Boston
Charles Franklin Thwing . . . . . Cleveland, O.

Edwin Sibley Webster . . . . . Brookline
Benjamin Loring Young . . . . . Weston

Class IV.—*The Humanities.*—202.

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Michael Joseph Ahern . . . . . Weston
Gordon Willard Allport . . . . . Cambridge
James Rowland Angell . . . . . New Haven, Conn.
John Gilbert Beebe-Center . . . . . Swampscott
Edwin Garrigues Boring . . . . . Cambridge
Edgar Sheffield Brightman . . . . . Newton
Henry Addington Bruce . . . . . Cambridge
Leonard Carmichael . . . . . Providence, R. I.
J(ames) McKeen Cattell . . . . . Garrison, N. Y.
George Croft Cell . . . . . Reading
Walter Fenno Dearborn . . . . . Cambridge
Edmund Burke Delabarre . . . . . Providence, R. I.
Raymond Dodge . . . . . New Haven, Conn.
Curt John Ducasse . . . . . Providence, R. I.
William Henry Paine Hatch . . . . . Cambridge
William Healy . . . . . Boston
William Arthur Heidel . . . . . Middletown, Conn.
William Ernest Hocking . . . . . Cambridge
Walter Samuel Hunter . . . . . Worcester
Frederick John Foakes Jackson . . . . . Englewood, N. J.
Truman Lee Kelley . . . . . Cambridge
Albert Cornelius Knudson . . . . . Cambridge
Kurt Koffka . . . . . Northampton
Karl Spencer Lashley . . . . . Chicago, Ill.
William Lawrence . . . . . Boston
Clarence Irving Lewis . . . . . Cambridge
Lee Sullivan McCollester . . . . . Tufts College
William McDougall . . . . . Durham, N. C.
Edward Caldwell Moore . . . . . Cambridge
Paul Elmer More . . . . . Princeton, N. J.
Arthur Darby Nock . . . . . Cambridge
William Cardinal O'Connell . . . . . Boston

Johnson O'Connor . . . . . Boston
Charles Edwards Park . . . . . Boston
Leighton Parks . . . . . London, England
Francis Greenwood Peabody . . . . . Cambridge
Carroll Cornelius Pratt . . . . . Cambridge
James Hugh Ryan . . . . . Washington, D. C.
Henry Knox Sherrill . . . . . Boston
Willard Learoyd Sperry . . . . . Cambridge
Russell Henry Stafford . . . . . Brookline
Lewis Madison Terman . . . . . Stanford University, Cal.
Edward Lee Thorndike . . . . . New York, N. Y.
Henry Bradford Washburn . . . . . Cambridge
John Broadus Watson . . . . . New York, N. Y.
Frederic Lyman Wells . . . . . Newton Highlands
Robert Mearns Yerkes . . . . . New Haven, Conn.

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Charles McLean Andrews . . . . . New Haven, Conn.
James Phinney Baxter, 3d . . . . . Cambridge
Carl Lotus Becker . . . . . Ithaca, N. Y.
Robert Pierpont Blake . . . . . Cambridge
Franz Boas . . . . . New York, N. Y.
William Brooks Cabot . . . . . Boston
Clarence Gordon Campbell . . . . . New York, N. Y.
George Henry Chase . . . . . Cambridge
Wilberforce Eames . . . . . New York, N. Y.
Ephraim Emerton . . . . . Cambridge
Max Farrand . . . . . San Marino, Cal.
William Scott Ferguson . . . . . Cambridge
Worthington Chauncey Ford . . . . . Cambridge
Henry Thatcher Fowler . . . . . Providence, R. I.
Evarts Boutell Greene . . . . . New York, N. Y.
Charles Homer Haskins . . . . . Cambridge
Charles Downer Hazen . . . . . New York, N. Y.
Bert Hodge Hill . . . . . Athens, Greece
Earnest Albert Hooton . . . . . Cambridge
Halford Lancaster Hoskins . . . . . Tufts College
Aleš Hrdlička . . . . . Washington, D. C.

Alfred Vincent Kidder . . . . . Washington, D. C.
Alfred Louis Kroeber . . . . . Berkeley, Cal.
Kirsopp Lake . . . . . Cambridge
George LaPiana . . . . . Cambridge
Waldo Gifford Leland . . . . . Washington, D. C.
Charles Howard McIlwain . . . . . Cambridge
Roger Bigelow Merriman . . . . . Cambridge
Samuel Eliot Morison . . . . . Boston
Robert Henry Pfeiffer . . . . . Cambridge
George Andrew Reisner . . . . . Boston
David Moore Robinson . . . . . Baltimore, Md.
Michael Ivanovich Rostovtzeff . . . . . New Haven, Conn.
Edward Sapir . . . . . New Haven, Conn.
George Sarton . . . . . Cambridge
Theodore Leslie Shear . . . . . Princeton, N. J.
Herbert Joseph Spinden . . . . . Brooklyn, N. Y.
John Osborne Sumner . . . . . Boston
Charles Holt Taylor . . . . . Cambridge
Charles Cutler Torrey . . . . . New Haven, Conn.
Alfred Marston Tozzer . . . . . Cambridge
Clark Wissler . . . . . New York, N. Y.
Lawrence Counselman Wroth . . . . . Providence, R. I.

CLASS IV., SECTION III.—*Philology.*—56.

Edward Cooke Armstrong . . . . . Princeton, N. J.
William Nickerson Bates . . . . . Philadelphia, Pa.
Campbell Bonner . . . . . Ann Arbor, Mich.
Carleton Brown . . . . . New York, N. Y.
Carl Darling Buck . . . . . Chicago, Ill.
Edward Capps . . . . . Princeton, N. J.
Walter Eugene Clark . . . . . Cambridge
Ronald Salmon Crane . . . . . Chicago, Ill.
Morris William Croll . . . . . Princeton, N. J.
Samuel Hazzard Cross . . . . . Cambridge
Franklin Edgerton . . . . . New Haven, Conn.
Frank Edgar Farley . . . . . Middletown, Conn.
Jeremiah Denis Mathias Ford . . . . . Cambridge
James Geddes, Jr. . . . . Brookline

Charles Hall Grandgent . . . . . Cambridge
Louis Herbert Gray . . . . . New York, N. Y.
William Chase Greene . . . . . Cambridge
Charles Burton Gulick . . . . . Cambridge
Roy Kenneth Hack . . . . . Cincinnati, Ohio
Austin Morris Harmon . . . . . New Haven, Conn.
Raymond Dexter Havens . . . . . Baltimore, Md.
George Lincoln Hendrickson . . . . . New Haven, Conn.
William Guild Howard . . . . . Cambridge
Eugene Xavier Louis Henry Hyvernat. . . . Washington, D. C.
Carl Newell Jackson . . . . . Cambridge
James Richard Jewett . . . . . Cambridge
(Ralph) Hayward Keniston . . . . . Chicago, Ill.
Roland Grubb Kent . . . . . Philadelphia, Pa.
George Lyman Kittredge . . . . . Cambridge
Hans Kurath . . . . . Providence, R. I.
Henry Roseman Lang . . . . . New Haven, Conn.
Ernest Felix Langley . . . . . Cambridge
Charles Rockwell Lanman . . . . . Cambridge
Ivan Mortimer Linforth . . . . . Berkeley, Cal.
David Gordon Lyon . . . . . Cambridge
Francis Peabody Magoun, Jr. . . . . Cambridge
Albert Matthews . . . . . Boston
William Albert Nitze . . . . . Chicago, Ill.
George Rapall Noyes. . . . . Berkeley, Cal.
William Abbott Oldfather . . . . . Urbana, Ill.
Milman Parry. . . . . Belmont
Howard Rollin Patch. . . . . Northampton
Arthur Stanley Pease. . . . . Cambridge
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Fred Norris Robinson . . . . . Cambridge
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Rudolph Schevill . . . . . Berkeley, Cal.
Horatio Elwin Smith . . . . . Providence, R. I.
Herbert Weir Smyth . . . . . Cambridge
Franklin Bache Stephenson . . . . . Washington, D. C.
William Thomson. . . . . Cambridge
George Benson Weston . . . . . Cambridge

Joshua Whatmough . . . . . Cambridge
Ernest Hatch Wilkins . . . . . Oberlin, Ohio
Harry Austryn Wolfson . . . . . Cambridge
Karl Young . . . . . New Haven, Conn.

CLASS IV., SECTION IV.—*The Fine Arts and Belles Lettres.*—56.

Stephen Vincent Benét . . . . . New York, N. Y.
Frank Weston Benson . . . . . Salem
(William) Welles Bosworth . . . . . New York, N. Y.
John Alden Carpenter . . . . . Chicago, Ill.
Chalmers Dancy Clifton . . . . . New York, N. Y.
Charles Collens . . . . . Newton Center
Kenneth John Conant . . . . . Cambridge
Charles Jay Connick . . . . . Newtonville
Frederick Shepherd Converse . . . . . Westwood
Charles Allerton Coolidge . . . . . Boston
Charles Townsend Copeland . . . . . Cambridge
Ralph Adams Cram . . . . . Boston
Cyrus Edwin Dallin . . . . . Arlington Heights
Samuel Foster Damon . . . . . Providence, R. I.
George Harold Edgell . . . . . Cambridge
William Emerson . . . . . Cambridge
Carl Engel . . . . . Washington, D. C.
John Erskine . . . . . New York, N. Y.
Arthur Fairbanks . . . . . Hanover, N. H.
Edward Waldo Forbes . . . . . Cambridge
Robert Frost . . . . . South Shaftsbury, Vt.
Wallace Goodrich . . . . . Boston
Robert Grant . . . . . Boston
Chester Noyes Greenough . . . . . Cambridge
Edward Burlingame Hill . . . . . Boston
Robert Silliman Hillyer . . . . . Cambridge
Charles Hopkinson . . . . . Manchester
Mark Antony DeWolfe Howe . . . . . Boston
Archer Milton Huntington . . . . . New York, N. Y.
Henry James . . . . . New York, N. Y.
William James. . . . . Cambridge
Leo Rich Lewis . . . . . Tufts College

John Ellerton Lodge . . . . . Washington, D. C.
Charles Martin Tornov Loeffler. . . . . Medfield
John Livingston Lowes . . . . . Cambridge
Charles Donagh Maginnis . . . . . Brookline
Paul Manship . . . . . New York, N. Y.
Daniel Gregory Mason . . . . . New York, N. Y.
Frank Jewett Mather . . . . . Washington Crossing, Pa.
Kenneth Ballard Murdock . . . . . Cambridge
William Allan Neilson . . . . . Northampton
Curtis Hidden Page . . . . . Gilmanton, N. H.
William Lyon Phelps . . . . . New Haven, Conn.
Anthony John Philpott . . . . . Arlington
Chandler Rathfon Post . . . . . Cambridge
Edwin Arlington Robinson . . . . . New York, N. Y.
Denman Waldo Ross . . . . . Cambridge
Paul Joseph Sachs . . . . . Cambridge
Ellery Sedgwick . . . . . Boston
Henry Dwight Sedgwick . . . . . Dedham
Henry Richardson Shepley . . . . . Brookline
David Stanley Smith. . . . . Woodbridge, Conn.
Edmund C. Tarbell . . . . . New Castle, N. H.
Charles Howard Walker . . . . . Boston
Owen Wister . . . . . Philadelphia, Pa.
Charles Henry Conrad Wright . . . . . Cambridge

FOREIGN HONORARY MEMBERS.—121.

(Number limited to one hundred and thirty.)

CLASS I.—*Mathematical and Physical Sciences.*—34.

SECTION I.—*Mathematics and Astronomy.*—9.

Arthur Stanley Eddington	Cambridge, England
Ronald Aylmer Fisher	Harpenden, Herts
Jacques Salomon Hadamard	Paris
Godfrey Harold Hardy	Cambridge, England
Ejnar Hertzsprung	Leyden
Tullio Levi-Civita	Rome
Charles Emile Picard	Paris
Charles Jean de la Vallée Poussin	Louvain
Hermann Weyl	Princeton, N. J.

CLASS I., SECTION II.—*Physics.*—9.

Vilhelm Frimann Koren Bjerknes	Oslo
Albert Einstein	Princeton, N. J.
James Franck	Copenhagen
Abram F. Joffé	Leningrad
Sir Joseph Larmor	Cambridge, England
Friedrich Paschen	Charlottenburg
Max Planck	Berlin
Ernest Rutherford, Baron Rutherford	Cambridge, England
Sir Joseph John Thomson	Cambridge, England

CLASS I., SECTION III.—*Chemistry.*—8.

Johannes N. Brönsted	Copenhagen
Peter Debye	Leipzig
Jaroslav Heyrovsky	Prague
Henri Louis Le Chatelier	Paris
Fritz Paneth	London
Sören Peter Lauritz Sörensen	Copenhagen
Heinrich Wieland	Munich
Richard Willstätter	Munich

CLASS I., SECTION IV.—*Technology and Engineering.*—8.

Paul Janet . . . . . Paris
Luigi Lombardi . . . . . Rome
Maurice d'Ocagne. . . . . Paris
Ludwig Prandtl . . . . . Göttingen
Emil Probst . . . . . Karlsruhe
Aurel Stodola . . . . . Zürich
Vsevolod Evgenievich Timonoff. . . . . Leningrad
Karl Willy Wagner . . . . . Berlin

CLASS II.—*Natural and Physiological Sciences.*—32.

SECTION I.—*Geology, Mineralogy, and Physics of the Globe.*—9.

Frank Dawson Adams . . . . . Montreal
Charles Barrois . . . . . Lille
Waldemar Christofer Brögger . . . . . Oslo
Léon William Collet . . . . . Geneva
Albert Heim . . . . . Zürich
Arthur Holmes . . . . . Durham
Emmanuel de Margerie . . . . . Paris
Gustaf Adolf Frederik Molengraaff . . . . . Delft
Sir William Napier Shaw . . . . . London

CLASS II., SECTION II.—*Botany.*—7.

Frederick Orpen Bower . . . . . Ripon
Ludwig Diels . . . . . Berlin
Kingo Miyabe. . . . . Sapporo, Japan
Alfred Barton Rendle . . . . Leatherhead, Surrey, England
Otto Renner . . . . . Jena
Albert Charles Seward . . . . . Cambridge, England
Hugo de Vries . . . . . Luntern

CLASS II., SECTION III.—*Zoology and Physiology.*—9.

George Albert Boulenger . . . . . Brussels
Maurice Caullery . . . . . Paris
Archibald Vivian Hill . . . . . London
August Krogh . . . . . Copenhagen
Louis Édouard Lapicque. . . . . Paris

George Henry Falkiner Nuttall . . . . . Cambridge, England
Charles Tate Regan . . . . . London
Hans Spemann . . . . . Freiburg i. Br.
D'Arcy Wentworth Thompson . . . . . St. Andrews

CLASS II., SECTION IV.—*Medicine and Surgery.*—7.

Sir Thomas Barlow, Bart. . . . . London
Sir Henry Hallett Dale . . . . . London
Sir Arthur Keith . . . . . London
Mikinosuke Miyajima . . . . . Tokyo
Friedrich von Müller . . . . . Munich
Sir Charles Scott Sherrington . . . . . Oxford
Sir Arnold Theiler . . . . . London

CLASS III.—*The Social Arts.*—21.

SECTION I.—*Jurisprudence.*—9.

Frantz Dahl . . . . . Copenhagen
Léon Duguit . . . . . Bordeaux
François Geny . . . . . Nancy
Hans Kelsen . . . . . Vienna
Juljusz Makarewicz . . . . . Lwów
Rt. Hon. Sir Frederick Pollock, Bart. . . . . London
Joseph Redlich . . . . . Cambridge, Mass.
Rudolph Stammler . . . . . Wernigerode a. H.
Giorgio Del Vecchio . . . . . Rome

SECTION II.—*Government, International Law, and Diplomacy.*—2.

Paul Claudel . . . . . Paris
Hu Shih . . . . . Peiping

SECTION III.,—*Economics and Sociology.*—7.

Arthur Lyon Bowley . . . . . Harpenden, Herts
Gustav Cassel . . . . . Djursholm, Sweden
Ralph George Hawtrey . . . . . London
Arthur Cecil Pigou . . . . . Cambridge, England
Charles Rist . . . . . Fraisses (Loire)
Werner Sombart . . . . . Berlin
Peter B. Struve . . . . . Belgrade

SECTION IV.—*Administration and Affairs.*—3.

Gösta A. Bagge . . . . . Stockholm
Rufus Daniel Isaacs, Marquess of Reading . . . . . London
Sir Josiah Stamp . . . . . Shortlands, Kent

CLASS IV.—*The Humanities.*—34.

SECTION I.—*Theology, Philosophy, and Psychology.*—7.

Henri Louis Bergson . . . . . Paris
Francis Crawford Burkitt . . . . . Cambridge, England
Benedetto Croce . . . . . Naples
Étienne Gilson . . . . . Melun
Edmund Husserl . . . . . Freiburg i. B.
Pierre Janet . . . . . Paris
Wolfgang Köhler . . . . . Berlin

SECTION II.—*History, Archæology, and Anthropology.*—10.

Rafael Altamira y Crevea . . . . . Madrid
Godfrey Rathbone Benson, Baron Charnwood . . . Lichfield
Wilhelm Dörpfeld . . . . . Berlin-Lichterfelde
Rt. Hon. Herbert Albert Laurens Fisher . . . . . Oxford
Friedrich Meinecke . . . . . Berlin-Dahlem
Karl Pearson . . . . . London
Henri Pirenne . . . . . Uccle-Brussels
Sir Aurel Stein . . . . . Srinagar, Kashmir
Charles Sanford Terry . . . . . Aberdeen
George Macaulay Trevelyan . . . . . Cambridge, England

SECTION III.—*Philology.*—8.

Joseph Bédier . . . . . Paris
Hermann Georg Jacobi . . . . . Bonn
Sylvain Lévi . . . . . Paris
Paul Mazon . . . . . Paris
Antoine Meillet . . . . . Paris
Hanns Oertel . . . . . Munich
Ramón Menéndez Pidal . . . . . Madrid
Frederick William Thomas . . . . . Oxford

SECTION IV.—*The Fine Arts and Belles Lettres.*—9.

Alfredo Casella	Rome
Henry Guy	Grenoble
Paul Hazard	Paris
Rudyard Kipling	Burwash, Sussex
Serge Koussevitzky	Paris and Boston
Victor Laloux	Paris
Gilbert Murray	Oxford
Edgar Allison Peers	Liverpool
Henri Rabaud	Paris

ALPHABETICAL INDEX TO LISTS OF MEMBERS.

The letters F and FHM refer to the lists of Fellows and Foreign Honorary Members, respectively. The class and section are indicated by the numerals following.

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Adams, C. A. F, I: 4
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Adams, C. R. F, I: 1
Adams, F. D. FHM, II: 1
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Bard, P. F, II: 3
Barlow, Sir T. FHM, II: 4
Barnett, S. J. F, I: 2
Barrois, C. FHM, II: 1
Barrows, H. K. F, I: 4
Barus, C. F, I: 2
Batchelder, C. F. F, III: 4
Bates, W. N. F, IV: 3
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Beebe-Center, J. G. F, IV: 1
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Benson, F. W. F, IV: 4
Bergson, H. L. FHM, IV: 1
Berry, C. H. F, I: 4
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Bigelow, G. H. F, III: 4
Bigelow, H. A. F, III: 1
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Bigelow, R. P. F, II: 3
Biklé, H. W. F, III: 1
Birkhoff, G. D. F, I: 1
Bjerknes, V. F. K. FHM, I: 2
Blake, R. P. F, IV: 2
Blakeslee, G. H. F, III: 2
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Burr, W. H. F, I: 4
Bush, V. F, I: 4
Byerly, W. E. F, I: 1
Cabot, R. C. F, III: 3
Cabot, W. B. F, IV: 2
Cady, W. G. F, I: 2
Campbell, C. G. F, IV: 2
Campbell, C. M. F, II: 4
Campbell, D. H. F, II: 2
Campbell, G. A. F, I: 2
Campbell, L. L. F, I: 2
Campbell, W. W. F, I: 1
Cannon, W. B. F, II: 3
Capps, E. F, IV: 3
Cardozo, B. N. F, III: 1
Carmichael, L. F, IV: 1
Carpenter, F. M. F, II: 1
Carpenter, J. A. F, IV: 4
Carpenter, T. M. F, II: 3
Carrel, A. F, II: 4
Carver, T. N. F, III: 3
Casella, A. FHM, IV: 4
Cassel, G. FHM, III: 3
Castle, W. B. F, II: 4
Castle, W. E. F, II: 3
Castle, W. R., Jr. F, III: 2
Cattell, J. M. F, IV: 1
Caullery, M. FHM, II: 3
Cell, G. C. F, IV: 1
Chaffee, E. L. F, I: 2
Chamberlain, J. P. F, III: 2
Chapin, C. V. F, II: 4
Charnwood, Lord. FHM, IV: 2
Chase, G. H. F, IV: 2
Cheever, D. F, II: 4
Chittenden, R. H. F, I: 3
Christian, H. A. F, II: 4
Clark, J. B. F, III: 3
Clark, J. M. F, III: 3
Clark, W. E. F, IV: 3
Claudel, P. FHM, III: 2
Clayton, H. H. F, II: 1
Cleland, H. F. F, II: 1
Cleveland, L. R. F, II: 3
Clifford, H. E. F, I: 4
Clifton, C. D. F, IV: 4
Clinton, G. P. F, II: 2
Cohn, E. J. F, II: 3
Cole, A. H. F, III: 3
Cole, R. F, II: 4
Collens, C. F, IV: 4
Collet, L. W. FHM, II: 1
Compton, A. H. F, I: 2
Compton, K. T. F, I: 2
Comstock, D. F. F, I: 2
Conant, J. B. F, I: 3
Conant, K. J. F, IV: 4
Conklin, E. G. F, II: 3
Connick, C. J. F, IV: 4
Converse, F. S. F, IV: 4
Coolidge, C. A. F, IV: 4
Coolidge, J. L. F, I: 1
Coolidge, W. D. F, I: 2
Copeland, C. T. F, IV: 4
Copeland, M. F, II: 3
Copeland, M. T. F, III: 3
Cousens, J. A. F, III: 4
Cram, R. A. F, IV: 4
Crane, R. S. F, IV: 3
Crane, R. T. F, III: 2
Crawford, F. H. F, I: 2

Crew, H. F, I: 2
Croce, B. FHM, IV: 1
Croll, M. W. F, IV: 3
Cross, S. H. F, IV: 3
Crozier, W. J. F, II: 3
Crum, W. L. F, III: 3
Cunningham, W. J. F, III: 3
Cushing, H. F, II: 4
Cushman, J. A. F, II: 3
Cutler, E. C. F, II: 4
Dahl, F. FHM, III: 1
Dahl, O. G. C. F, I: 4
Dale, Sir H. H. FHM, II: 4
Dallin, C. E. F, IV: 4
Daly, R. A. F, II: 1
Damon, S. F. F, IV: 4
Dana, E. S. F, II: 1
Daniels, W. M. F, III: 3
Davenport, C. B. F, II: 3
Davis, B. M. F, II: 2
Davis, H. F, II: 3
Davis, H. N. F, I: 2
Davis, T. L. F, I: 3
Davisson, C. J. F, I: 2
Dawes, C. L. F, I: 4
Dawson, A. B. F, II: 3
Day, A. L. F, I: 2
Day, C. F, III: 3
Dearborn, W. F. F, IV: 1
Debye, P. FHM, I: 3
Delabarre, E. B. F, IV: 1
Den Hartog, J. P. F, I: 4
Dennison, H. S. F, III: 4
Detwiler, S. R. F, II: 3
Dewey, D. R. F, III: 3
Dewing, A. S. F, III: 3
Dickinson, J. F, III: 1
Dickson, L. E. F, I: 1
Diels, L. FHM, II: 2
Dillon, T. H. F, I: 4
Dodge, R. F, IV: 1
Dörpfeld, W. FHM, IV: 2
Donham, W. B. F, III: 3
Douglas, J. F, I: 1
Drinker, P. F, I: 4
Drisko, W. J. F, I: 2
Duane, W. F, I: 2
Du Bois, E. F. F, II: 4
Ducasse, C. J. F, IV: 1
Duff, A. W. F, I: 2
Duguit, L. FHM, III: 1
Dunn, G. F, I: 4
Durand, W. F. F, I: 4
Eames, W. F, IV: 2
East, E. M. F, II: 2
Ebersole, J. F. F, III: 3
Eddington, A. S. FHM, I: 1
Edgell, G. H. F, IV: 4
Edgerton, F. F, IV: 3
Einstein, A. FHM, I: 2
Emerson, R. A. F, II: 2
Emerson, W. F, IV: 4
Emerton, E. F, IV: 2
Engel, C. F, IV: 4
Erskine, J. F, IV: 4
Evans, A. W. F, II: 2
Evans, G. C. F, I: 1
Evans, H. M. F, II: 3
Ewell, A. W. F, I: 2
Fair, G. M. F, I: 4
Fairbanks, A. F, IV: 4
Fall, H. C. F, II: 3
Farley, F. E. F, IV: 3
Farrand, M. F, IV: 2
Faull, J. H. F, II: 2
Fay, F. H. F, I: 4
Fay, H. F, I: 3
Fay, S. B. F, III: 2
Ferguson, W. S. F, IV: 2
Fergusson, S. P. F, II: 1
Fernald, M. L. F, II: 2
Field, F. T. F, III: 1
Field, W. L. W. F, III: 4
Fieser, L. F. F, I: 3
Fisher, H. A. L. FHM, IV: 2
Fisher, I. F, III: 3
Fisher, R. A. FHM, I: 1
Fiske, C. H. F, II: 3
Fitz, R. F, II: 4
Flexner, S. F, II: 4
Forbes, A. F, II: 3
Forbes, E. W. F, IV: 4

Forbes, G. S. F, I: 3
Forbes, W. C. F, III: 2
Ford, J. F, III: 3
Ford, J. D. M. F, IV: 3
Ford, W. C. F, IV: 2
Ford, W. E. F, II: 1
Fowler, H. T. F, IV: 2
Fox, P. F, I: 1
Franck, J. FHM, I: 2
Frankfurter, F. F, III: 1
Franklin, E. C. F, I: 3
Franklin, F. F, I: 1
Franklin, P. F, I: 1
Freeman, R. E. F, III: 3
Frost, E. B. F, I: 1
Frost, R. F, IV: 4
Fulton, J. F. F, II: 3
Furniss, E. S. F, III: 2
Gage, T. H. F, III: 1
Gamble, J. L. F, II: 4
Gay, E. F. F, III: 3
Geddes, J., Jr. F, IV: 3
Geny, F. FHM, III: 1
Gilboy, G. F, I: 4
Gillespie, L. J. F, I: 3
Gilson, E. FHM, IV: 1
Glueck, S. F, III: 3
Goldthwait, J. W. F, II: 1
Goodale, J. L. F, II: 4
Goodnow, F. J. F, III: 4
Goodrich, W. F, IV: 4
Goodwin, H. M. F, I: 2
Grandgent, C. H. F, IV: 3
Grant, R. F, IV: 4
Graton, L. C. F, II: 1
Graustein, W. C. F, I: 1
Gray, L. H. F, IV: 3
Green, T. F. F, III: 1
Greene, E. B. F, IV: 2
Greene, W. C. F, IV: 3
Greenough, C. N. F, IV: 4
Greenough, R. B. F, II: 4
Gregory, H. E. F, II: 1
Gregory, W. K. F, II: 3
Grew, J. C. F, III: 2
Grinnell, J. F, II: 3
Gulick, C. B. F, IV: 3
Guy, H. FHM, IV: 4
Hack, R. K. F, IV: 3
Hadamard, J. S. FHM, I: 1
Haertlein, A. F, I: 4
Haig, R. M. F, III: 3
Hale, G. E. F, I: 2
Hall, E. H. F, I: 2
Hall, W. P. F, III: 1
Hammond, J. H. F, I: 4
Hand, L. F, III: 1
Hardy, A. C. F, I: 2
Hardy, G. H. FHM, I: 1
Harmon, A. M. F, IV: 3
Harper, R. A. F, II: 2
Harrison, G. R. F, I: 2
Harrison, R. G. F, II: 4
Hart, A. B. F, III: 2
Hart, F. R. F, III: 4
Haskins, C. H. F, IV: 2
Hatch, W. H. P. F, IV: 1
Havens, R. D. F, IV: 3
Hawtrey, R. G. FHM, III: 3
Hayes, H. V. F, I: 2
Hazard, P. FHM, IV: 4
Hazen, C. D. F, IV: 2
Healy, W. F, IV: 1
Heidel, W. A. F, IV: 1
Heim, A. FHM, II: 1
Henderson, L. J. F, I: 3
Hendrickson, G. L. F, IV: 3
Henshaw, S. F, II: 3
Hertzsprung, E. FHM, I: 1
Heyrovsky, J. FHM, I: 3
Hill, A. V. FHM, II: 3
Hill, B. H. F, IV: 2
Hill, E. B. F, IV: 4
Hille, E. F, I: 1
Hillyer, R. S. F, IV: 4
Hitchcock, A. S. F, II: 2
Hitchcock, F. L. F, I: 1
Hoadley, L. F, II: 3
Hoagland, H. F, II: 3
Hocking, W. E. F, IV: 1
Holcombe, A. N. F, III: 2
Holmes, A. FHM, II: 1

Holmes, E. J. F, III: 4
Holmes, H. W. F, III: 3
Holmes, S. J. F, II: 3
Hooton, E. A. F, IV: 2
Hopkinson, C. F, IV: 4
Hoskins, H. L. F, IV: 2
Hoskins, R. G. F, II: 3
Hovgaard, W. F, I: 4
Howard, L. O. F, II: 3
Howard, W. G. F, IV: 3
Howe, M. A. DeW. F, IV: 4
Howe, P. R. F, II: 4
Howell, W. H. F, II: 4
Hrdlicka, A. F, IV: 2
Hu Shih. FHM, III: 2
Hubbard, J. C. F, I: 2
Hudson, M. O. F, III: 2
Hughes, C. E. F, III: 1
Hull, G. F. F, I: 2
Hume, E. E. F, II: 4
Humphreys, W. J. F, II: 1
Hunsaker, J. C. F, I: 4
Hunt, R. F, II: 4
Hunter, W. S. F, IV: 1
Huntington, A. M. F, IV: 4
Huntington, E. F, II: 1
Huntington, E. V. F, I: 1
Husserl, E. FHM, IV: 1
Hutchins, C. C. F, I: 2
Hyvernat, E. X. L. H. F, IV: 3
Isaacs, N. F, III: 1
Ives, F. E. F, I: 2
Ives, J. E. F, I: 2
Jack, J. G. F, II: 2
Jack, J. R. F, I: 4
Jackson, C. L. F, I: 3
Jackson, C. N. F, IV: 3
Jackson, D. F, I: 1
Jackson, D. C. F, I: 4
Jackson, F. J. F. F, IV: 1
Jackson, H., Jr. F, II: 4
Jackson, R. T. F, II: 1
Jacobi, H. G. FHM, IV: 3
Jaggar, T. A. F, II: 1
James, E. R. F, III: 1
James, H. F, IV: 4
James, W. F, IV: 4
Janet, Paul. FHM, I: 4
Janet, Pierre. FHM, IV: 1
Jennings, H. S. F, II: 3
Jennings, W. L. F, I: 3
Jepson, W. L. F, II: 2
Jessup, P. C. F, III: 2
Jewett, F. B. F, I: 4
Jewett, J. R. F, IV: 3
Joffé, A. F. FHM, I: 2
Johnson, D. W. F, II: 1
Johnson, L. J. F, I: 4
Johnston, I. M. F, II: 2
Jones, D. F. F, II: 2
Jones, G. F, I: 3
Jones, M. B. F, III: 4
Joslin, E. P. F, II: 4
Keith, Sir A. FHM, II: 4
Keith, A. F, II: 1
Kelley, T. L. F, IV: 1
Kelsen, H. FHM, III: 1
Kemble, E. C. F, I: 2
Kemmerer, E. W. F, III: 3
Kendall, H. P. F, III: 4
Keniston, H. F, IV: 3
Kennelly, A. E. F, I: 4
Kent, N. A. F, I: 2
Kent, R. G. F, IV: 3
Keyes, F. G. F, I: 3
Kidder, A. V. F, IV: 2
Kidder, N. T. F, III: 4
Kipling, R. FHM, IV: 4
Kistiakowsky, G. B. F, I: 3
Kittredge, G. L. F, IV: 3
Knight, F. H. F, III: 3
Knudson, A. C. F, IV: 1
Köhler, W. FHM, IV: 1
Koffka, K. F, IV: 1
Kofoid, C. A. F, II: 3
Kohler, E. P. F, I: 3
Koussevitzky, S. FHM, IV: 4
Kraus, C. A. F, I: 3
Kroeber, A. L. F, IV: 2
Krogh, A. FHM, II: 3
Kurath, H. F, IV: 3
Lake, K. F, IV: 2

Laloux, V. FHM, IV: 4
Lamb, A. B. F, I: 3
Lamont, T. W. F, III: 4
Lampland, C. O. F, I: 1
Lane, A. C. F, II: 1
Lang, H. R. F, IV: 3
Langley, E. F. F, IV: 3
Langmuir, I. F, I: 3
Lanman, C. R. F, IV: 3
La Piana, G. F, IV: 2
Lapicque, L. E. FHM, II: 3
Larmor, Sir J. FHM, I: 2
Larsen, E. S. F, II: 1
Lashley, K. S. F, IV: 1
Lawrence, R. R. F, I: 4
Lawrence, W. F, IV: 1
Lawrence, W. H. F, I: 4
Laws, F. A. F, I: 2
Lawson, A. C. F, II: 1
Lawton, F. F, III: 1
Le Chatelier, H. L. FHM, I: 3
Lee, R. I. F, II: 4
Lefavour, H. F, I: 2
Leith, C. K. F, II: 1
Leland, W. G. F, IV: 2
Lévi, S. FHM, IV: 3
Levi-Civita, T. FHM, I: 1
Lewis, C. I. F, IV: 1
Lewis, F. T. F, II: 3
Lewis, G. N. F, I: 3
Lewis, L. R. F, IV: 4
Lewis, W. K. F, I: 3
Lillie, F. R. F, II: 3
Lillie, R. S. F, II: 3
Lindgren, W. F, II: 1
Lindsay, R. B. F, I: 2
Linforth, I. M. F, IV: 3
Lipman, J. G. F, II: 2
Little, A. D. F, I: 3
Little, C. C. F, III: 4
Livingston, B. E. F, II: 2
Locke, E. A. F, II: 4
Lodge, J. E. F, IV: 4
Loeffler, C. M. T. F, IV: 4
Lombardi, L. FHM, I: 4
Longcope, W. T. F, II: 4
Loomis, F. B. F, II: 1
Lowell, A. L. F, III: 2
Lowes, J. L. F, IV: 4
Lull, R. S. F, II: 3
Lund, F. B. F, II: 4
Luyten, W. J. F, I: 1
Lyman, T. F, I: 2
Lyon, D. G. F, IV: 3
McAdie, A. G. F, II: 1
McCollester, L. S. F, IV: 1
MacDonald, W. F, III: 2
McDougall, W. F, IV: 1
McEwen, G. F. F, II: 1
McIlwain, C. H. F, IV: 2
MacInnes, D. A. F, I: 3
MacIver, R. M. F, III: 3
McKeehan, L. W. F, I: 2
McLaren, W. W. F, III: 3
McLaughlin, D. H. F, II: 1
Macneil, S. F, III: 1
Maginnis, C. D. F, IV: 4
Magoun, F. P., Jr. F, IV: 3
Magrath, G. B. F, II: 4
Magruder, C. F, III: 1
Main, C. T. F, I: 4
Makarewicz, J. FHM, III: 1
Mallory, F. B. F, II: 4
Manship, P. F, IV: 4
Margerie, E. de. FHM, II: 1
Mark, E. L. F, II: 3
Mark, K. L. F, I: 3
Marks, L. S. F, I: 4
Marshall, L. C. F, III: 3
Mason, D. G. F, IV: 4
Mason, E. S. F, III: 3
Mather, F. J. F, IV: 4
Mather, K. F. F, II: 1
Mathews, E. B. F, II: 1
Matthews, A. F, IV: 3
May, J. V. F, III: 4
Mayo, W. J. F, II: 4
Mazon, P. FHM, IV: 3
Mead, A. D. F, II: 3
Meillet, A. FHM, IV: 3
Meinecke, F. FHM, IV: 2
Melander, A. L. F, II: 3

Mendel, L. B. F, I: 3
Menzel, D. H. F, I: 1
Meriam, R. S. F, III: 3
Merriam, C. E. F, III: 2
Merriam, J. C. F, II: 1
Merrill, E. D. F, II: 2
Merriman, R. B. F, IV: 2
Merritt, E. G. F, I: 2
Miller, D. C. F, I: 2
Miller, G. A. F, 1: 1
Miller, G. S. F, II: 3
Miller, J. A. F, I: 1
Miller, W. J. F, II: 1
Millikan, R. A. F, I: 2
Millis, H. A. F, III: 3
Mills, F. C. F, III: 3
Mills, O. L. F, III: 2
Mimno, H. R. F, I: 2
Miner, L. M. S. F, II: 4
Minot, G. R. F, II: 4
Mitchell, S. A. F, I: 1
Mitchell, W. C. F, III: 3
Mitchell, W. DeW. F, III: 1
Miyabe, K. FHM, II: 2
Miyajima, M. FHM, II: 4
Molengraaff, G. A. F. FHM, II: 1
Monroe, A. E. F, III: 3
Moore, E. C. F, IV: 1
Moore, J. B. F, III: 2
More, P. E. F, IV: 1
Moreland, E. L. F, I: 4
Morgan, E. M. F, III: 1
Morgan, T. H. F, II: 3
Morison, S. E. F, IV: 2
Morley, F. F, I: 1
Morris, F. K. F, II: 1
Morse, H. W. F, I: 2
Morse, M. F, I: 1
Morse, P. M. F, I: 2
Moss, W. L. F, II: 4
Moulton, F. R. F, I: 1
Moulton, H. G. F, III: 3
Mueller, E. F, I: 3
Müller, F. von. FHM, II: 4
Mueller, J. H. F, II: 4
Munro, W. B. F, III: 2
Munroe, C. E. F, I: 3
Murdock, K. B. F, IV: 4
Murray, G. FHM, IV: 4
Neal, H. V. F, II: 3
Neilson, W. A. F, IV: 4
Newhouse, W. H. F, II: 1
Nichols, E. L. F, I: 2
Nitze, W. A. F, IV: 3
Nock, A. D. F, IV: I
Norris, J. F. F, I: 3
Norton, A. E. F, I: 4
Norton, C. L. F, I: 2
Nourse, E. G. F, III: 3
Noyes, A. A. F, I: 3
Noyes, G. R. F, IV: 3
Noyes, W. A. F, I: 3
Noyes, W. A., Jr. F, I: 3
Nuttall, G. H. F. FHM, II: 3
d'Ocagne, M. FHM, I: 4
O'Connell, W. H. F, IV: 1
O'Connor, J. F, IV: 1
Oertel, H. FHM, IV: 3
Ogburn, W. F. F, III: 3
Oldenberg, O. F, I: 2
Oldfather, W. A. F, IV: 3
Olmsted, F. L. F, I: 4
Osborn, H. F. F, II: 3
Osgood, R. B. F, II: 4
Osterhout, W. J. V. F, II: 2
Page, C. H. F, IV: 4
Page, L. F, I: 2
Palache, C. F, II: 1
Paneth, F. FHM, I: 3
Park, C. E. F, IV: 1
Park, C. F. F, I: 4
Park, R. E. F, III: 3
Parker, G. H. F, II: 3
Parker, H. F, III: 1
Parks, L. F, IV: 1
Parry, M. F, IV: 3
Paschen, F. FHM, I: 2
Patch, H. R. F, IV: 3
Peabody, F. G. F, IV: 1
Pearl, R. F, II: 3
Pearse, L. F, I: 4
Pearson, K. FHM, IV: 2

Pease, A. S. F, IV: 3
Peers, E. A. FHM, IV: 4
Peirce, G. J. F, II: 2
Pender, H. F, I: 4
Pepper, G. W. F, III: 1
Perkins, T. N. F, III: 4
Persons, W. M. F, III: 3
Peters, A. J. F, III: 4
Pfeiffer, R. H. F, IV: 2
Phelps, W. L. F, IV: 4
Phillips, H. B. F, I: 1
Phillips, J. C. F, II: 3
Philpott, A. J. F, IV: 4
Picard, C. E. FHM, I: 1
Pickard, G. W. F, I: 4
Pickering, W. H. F, I: 1
Pidal, R. M. FHM, IV: 3
Pierce, G. W. F, I: 2
Pigou, A. C. FHM, III: 3
Pilsbry, H. A. F, II: 3
Pirenne, H. FHM, IV: 2
Planck, M. FHM, I: 2
Pollock, Sir F. FHM, III: 1
Poor, C. L. F, I: 1
Post, C. R. F, IV: 4
Pound, R. F, III: 1
Prandtl, L. FHM, I: 4
Pratt, C. C. F, IV: 1
Pratt, F. H. F, II: 3
Pratt, J. H. F, II: 4
Prescott, S. C. F, I: 3
Probst, E. FHM, I: 4
Pupin, M. I. F, I: 2
Putnam, H. F, III: 4
Quinby, W. C. F, II: 4
Rabaud, H. FHM, IV: 4
Rand, E. K. F, IV: 3
Rand, H. W. F, II: 3
Rapport, D. F, II: 3
Raymond, P. E. F, II: 1
Reading, Lord. FHM, III: 4
Redfield, A. C. F, II: 3
Redlich, J. FHM, III: 1
Regan, C. T. FHM, II: 3
Rehder, A. F, II: 2
Reisner, G. A. F, IV: 2
Rendle, A. B. FHM, II: 2
Renner, O. FHM, II: 2
Richards, A. N. F, II: 3
Richards, R. H. F, I: 3
Richardson, R. G. D. F, I: 1
Riddle, O. F, II: 3
Ripley, A. L. F, III: 4
Rist, C. FHM, III: 3
Ritter, W. E. F, II: 3
Robinson, B. L. F, II: 2
Robinson, D. M. F, IV: 2
Robinson, E. A. F, IV: 4
Robinson, F. N. F, IV: 3
Rogers, A. F. F, II: 1
Root, E. F, III: 1
Root, R. K. F, IV: 3
Rosanoff, M. A. F, I: 3
Rosenau, M. J. F, II: 4
Ross, D. W. F, IV: 4
Rossby, C. G. A. F, II: 1
Rostovtzeff, M. I. F, IV: 2
Rowe, L. S. F, III: 3
Rugg, A. P. F, III: 1
Ruggles, A. H. F, II: 4
Russell, G. E. F, I: 4
Russell, H. N. F, I: 1
Rutherford, Baron. FHM, I: 2
Ruthven, A. G. F, II: 3
Rutledge, G. F, I: 1
Ryan, J. H. F, IV: 1
Sachs, P. J. F, IV: 4
Sapir, E. F, IV: 2
Sarton, G. F, IV: 2
Saunders, F. A. F, I: 2
Sauveur, A. F, I: 4
Sax, K. F, II: 2
Sayles, R. W. F, II: 1
Sayre, F. B. F, III: 1
Scatchard, G. F, I: 3
Schaller, W. T. F, II: 1
Schell, E. H. F, III: 4
Schevill, R. F, IV: 3
Schlesinger, F. F, I: 1
Schuchert, C. F, II: 1
Schumb, W. C. F, I: 3
Schumpeter, J. A. F, III: 3

Scott, A. W. F, III: 1
Scott, W. B. F, II: 1
Sedgwick, E. F, IV: 4
Sedgwick, H. D. F, IV: 4
Sellards, A. W. F, II: 4
Setchell, W. A. F, II: 2
Seward, A. C. FHM, II: 2
Shapley, H. F, I: 1
Shattuck, F. C. F, II: 4
Shaw, Sir W. N. FHM, II: 1
Shear, T. L. F, IV: 2
Shepley, H. R. F, IV: 4
Sherrill, H. K. F, IV: 1
Sherrill, M. S. F, I: 3
Sherrington, Sir C. S. FHM, II: 4
Shimer, H. W. F, II: 1
Sinnott, E. W. F, II: 2
Slater, J. C. F, I: 2
Slipher, V. M. F, I: 1
Slocum, F. F, I: 1
Smith, D. S. F, IV: 4
Smith, G. M. F, II: 2
Smith, H. E. F, IV: 3
Smith, H. M. F, I: 3
Smith, J., Jr. F, III: 4
Smith, L. B. F, I: 3
Smith, P. F, III: 4
Smyth, H. L. F, I: 4
Smyth, H. W. F, IV: 3
Snyder, C. F, III: 3
Snyder, V. F, I: 1
Sörensen, S. P. L. FHM, I: 3
Sollmann, T. H. F, II: 4
Sombart, W. FHM, III: 3
Sorokin, P. A. F, III: 3
Spemann, H. FHM, II: 3
Sperry, W. L. F, IV: 1
Spinden, H. J. F, IV: 2
Spofford, C. M. F, I: 4
Sprague, O. M. W. F, III: 3
Stafford, R. H. F, IV: 1
Stakman, E. C. F, II: 2
Stammler, R. FHM, II: 1
Stamp, Sir J. FHM, III: 4
Stearns, A. W. F, III: 4
Stebbins, J. F, I: 1
Stein, Sir A. FHM, IV: 2
Stephenson, F. B. F, IV: 3
Stetson, H. T. F, I: 1
Stevens, J. F. F, I: 4
Stieglitz, J. O. F, I: 3
Stiles, C. W. F, II: 4
Stiles, P. G. F, II: 3
Stodola, A. FHM, I: 4
Stone, H. F. F, III: 1
Stone, J. S. F, I: 2
Stone, M. H. F, I: 1
Strong, R. P. F, II: 4
Struik, D. J. F, I: 1
Struve, P. B. FHM, III: 3
Sumner, J. O. F, IV: 2
Taber, H. F, I: 1
Talbot, F. B. F, II: 4
Tamarkin, J. D. F, I: 1
Tarbell, E. C. F, IV: 4
Taussig, F. W. F, III: 3
Taylor, C. H. F, III: 4
Taylor, C. H. F, IV: 2
Taylor, F. B. F, II: 1
Teggart, F. J. F, III: 3
Terman, L. M. F, IV: 1
Terry, C. S. FHM, IV: 2
Theiler, Sir A. FHM, II: 4
Thomas, F. W. FHM, IV: 3
Thomas, W. I. F, III: 3
Thompson, D'A. W. FHM, II: 3
Thompson, M. deK. F, I: 2
Thomson, E. F, I: 2
Thomson, Sir J. J. FHM, I: 2
Thomson, W. F, IV: 3
Thorndike, E. L. F, IV: 1
Thurston, E. S. F, III: 1
Thwing, C. F. F, III: 4
Timonoff, V. E. FHM, I: 4
Tolman, R. C. F, I: 3
Torrey, C. C. F, IV: 2
Tozzer, A. M. F, IV: 2
Trelease, W. F, II: 2
Trevelyan, G. M. FHM, IV: 2
Tucker, D. S. F, III: 3
Tyler, H. W. F, I: 1
Tyzzer, E. E. F, II: 4

Usher, A. P. F, III: 3
Vallarta, M. S. F, I: 2
Vallée Poussin, C. J. de la. FHM, I: 1
Van Vleck, J. H. F, I: 2
Vaughan, T. W. F, II: 1
Veblen, O. F, I: 1
Vecchio, G. Del. FHM, III: 1
Verhoeff, F. H. F, II: 4
Viner, J. F, III: 3
Vries, H. de. FHM, II: 2
Wagner, K. W. FHM, I: 4
Wat, W. C. F, III: 1
Walker, C. H. F, IV: 4
Walsh, J. L. F, I: 1
Wambaugh, E. F, III: 1
Warner, E. P. F, I: 4
Warren, C. H. F, II: 1
Washburn, H. B. F, IV: 1
Watson, J. B. F, IV: 1
Wearn, J. T. F, II: 4
Weatherby, C. A. F, II: 2
Webster, D. L. F, I: 2
Webster, E. S. F, III: 4
Weiss, S. F, II: 4
Wells, A. E. F, I: 4
Wells, F. L. F, IV: 1
Weston, G. B. F, IV: 3
Weston, R. S. F, I: 4
Weston, W. H. F, II: 2
Wetmore, R. H. F, II: 2
Weyl, H. FHM, I: 1
Weysse, A. W. F, II: 3
Whatmough, J. F, IV: 3
Wheeler, W. M. F, II: 3
White, B. F, II: 4
White, D. F, II: 1
Whitehead, A. N. F, I: 1
Whitlock, H. P. F, II: 1
Whitman, E. A. F, III: 1
Whitney, W. R. F, I: 3
Wickersham, G. W. F, III: 1
Widder, D. V. F, I: 1
Wieland, H. FHM, I: 3
Wilkins, E. H. F, IV: 3
Williams, F. H. F, II: 4
Williams, J. H. F, III: 3
Williams, R. S. F, I: 3
Willis, B. F, II: 1
Willoughby, W. F. F, III: 2
Willoughby, W. W. F, III: 2
Willstätter, R. FHM, I: 3
Wilson, E. B. F, II: 3
Wilson, E. B. F, I: 2
Wilson, G. G. F, III: 2
Winsor, F. E. F, I: 4
Wissler, C. F, IV: 2
Wister, O. F, IV: 4
Wolbach, S. B. F, II: 4
Wolff, J. E. F, II: 1
Wolfson, H. A. F, IV: 3
Wolman, L. F, III: 3
Wood, R. W. F, I: 2
Woodman, A. G. F, I: 3
Woods, F. A. F, II: 3
Woods, F. S. F, I: 1
Worcester, J. R. F, I: 4
Worrall, D. E. F, I: 3
Wright, C. H. C. F, IV: 4
Wright, F. E. F, II: 1
Wright, Q. F, III: 2
Wroth, L. C. F, IV: 2
Wyman, J., Jr. F, II: 3
Yeomans, H. A. F, III: 2
Yerkes, R. M. F, IV: 1
Young, B. L. F, III: 4
Young, K. F, IV: 3
Zeleny, J. F, I: 2
Zimmerman, C. C. F, III: 3
Zinsser, H. F, II: 4

STATUTES AND STANDING VOTES.

STATUTES.

Adopted November 8, 1911: *amended May* 8, 1912, *January* 8, *and May* 14, 1913, *April* 14, 1915, *April* 12, 1916, *April* 10, 1918, *May* 14, 1919, *February* 8, *April* 12, *and December* 13, 1922, *February* 14, *March* 14, *and October* 10, 1923, *March* 10, 1926, *May* 9, 1928, *April* 8 *and November* 11, 1931, *April* 12, 1933, *and February* 14, 1934.

CHAPTER I.

The Corporate Seal.

Article 1. The Corporate Seal of the Academy shall be as here depicted:

Article 2. The Recording Secretary shall have the custody of the Corporate Seal.

See Chap. v, art. 3; chap. vi, art. 2.

CHAPTER II.

Fellows and Foreign Honorary Members and Dues.

Article 1. The Academy consists of Fellows, who are either citizens or residents of the United States of America, and Foreign Honorary Members. They are arranged in four Classes, according to the Arts and Sciences in which they are severally proficient, and each Class is divided into four Sections, namely:

Class I. *The Mathematical and Physical Sciences*

Section 1. Mathematics and Astronomy
Section 2. Physics
Section 3. Chemistry
Section 4. Technology and Engineering

Class II. *The Natural and Physiological Sciences*

Section 1. Geology, Mineralogy, and Physics of the Globe
Section 2. Botany
Section 3. Zoölogy and Physiology
Section 4. Medicine and Surgery

Class III. *The Social Arts*

Section 1. Jurisprudence
Section 2. Government, International Law, and Diplomacy
Section 3. Economics and Sociology
Section 4. Administration and Affairs

Class IV. *The Humanities*

Section 1. Theology, Philosophy, and Psychology
Section 2. History, Archæology, and Anthropology
Section 3. Philology
Section 4. The Fine Arts and Belles Lettres

Article 2. The number of Fellows shall not exceed Eight hundred, of whom not more than Six hundred shall be residents of Massachusetts, nor shall there be more than Two hundred and twenty in any one Class.

Article 3. The number of Foreign Honorary Members shall not exceed One hundred and thirty. They shall be chosen from among citizens of foreign countries most eminent for their discoveries and

attainments in any of the Classes above enumerated. There shall not be more than Thirty-five in any one Class.

ARTICLE 4. If any person, after being notified of his election as Fellow, shall neglect for six months to accept in writing, or, if a Fellow resident within fifty miles of Boston shall neglect to pay his Admission Fee, his election shall be void; and if any Fellow resident within fifty miles of Boston shall neglect to pay his Annual Dues for six months after they are due, provided his attention shall have been called to this Article of the Statutes in the meantime, he shall cease to be a Fellow; but the Council may suspend the provisions of this Article for a reasonable time.

With the previous consent of the Council, the Treasurer may dispense (*sub silentio*) with the payment of the Admission Fee or of the Annual Dues or both whenever he shall deem it advisable. In the case of officers of the Army or Navy who are out of the Commonwealth on duty, payment of the Annual Dues may be waived during such absence if continued during the whole financial year and if notification of such expected absence be sent to the Treasurer. Upon similar notification to the Treasurer, similar exemption may be accorded to Fellows subject to Annual Dues, who may temporarily remove their residence for at least two years to a place more than fifty miles from Boston.

If any person elected a Foreign Honorary Member shall neglect for six months after being notified of his election to accept in writing, his election shall be void.

See Chap. vii, art. 2.

ARTICLE 5. Every Fellow resident within fifty miles of Boston hereafter elected shall pay an Admission Fee of Ten dollars, unless previously as an Associate he has paid an Admission Fee of like amount.

Every Fellow resident within fifty miles of Boston shall, and others may, pay such Annual Dues, not exceeding Fifteen dollars, as shall be voted by the Academy at each Annual Meeting, when they shall become due; but any Fellow shall be exempt from the annual payment if, at any time after his admission, he shall pay into the treasury Two hundred dollars in addition to his previous payments. Any Fellow shall also be exempt from Annual Dues who has paid such dues

for forty years, or, having attained the age of seventy-five has paid dues for twenty-five years.

All Commutations of the Annual Dues shall be and remain permanently founded, the interest only to be used for current expenses.

Any Fellow not previously subject to Annual Dues who takes up his residence within fifty miles of Boston, shall pay to the Treasurer within three months thereafter Annual Dues for the current year, failing which his Fellowship shall cease; but the Council may suspend the provisions of this Article for a reasonable time.

Only Fellows who pay Annual Dues or have commuted them may hold office in the Academy or serve on the Standing Committees or vote at meetings.

ARTICLE 6. Fellows who pay or have commuted the Annual Dues and Foreign Honorary Members shall be entitled to receive gratis one copy of all Publications of the Academy issued after their election.

See Chap. xi, art. 2.

ARTICLE 7. Diplomas signed by the President and the Vice-President of the Class to which the member belongs, and countersigned by the Secretaries, shall be given to Foreign Honorary Members and to Fellows on request.

ARTICLE 8. If, in the opinion of a majority of the entire Council, any Fellow or Foreign Honorary Member shall have rendered himself unworthy of a place in the Academy, the Council shall recommend to the Academy the termination of his membership; and if three-fourths of the Fellows present, out of a total attendance of not less than fifty at a Stated Meeting, or at a Special Meeting called for the purpose, shall adopt this recommendation, his name shall be stricken from the Roll.

See Chap. iii; chap. vi, art. 1; chap. x, art. 1, 7; chap. xi, art. 2.

CHAPTER III.

ELECTION OF FELLOWS AND FOREIGN HONORARY MEMBERS.

The procedure in the election of Fellows and Foreign Honorary Members shall be as follows:

Nominations to Fellowship or Foreign Honorary Membership in any Section must be signed by Two Fellows of that Section, or by three Fellows of any Sections, and sent to the Corresponding Secretary ac-

companied by a statement of the qualifications of the nominee and brief biographical data.

Notice shall be sent to every Fellow not later than the fifteenth of January in each year, reminding him that all nominations must be in the hands of the Corresponding Secretary before the fifteenth of February following.

A list of the nominees, giving a brief account of each, with the names of the nominators, shall be sent to every Fellow with a request that he return the list with such confidential comments and indications of preference as he may choose to make.

All the nominations, with any comments thereon and with expressions of preference on the part of the Fellows, shall be referred to the appropriate Class Committees, which shall canvass them, and report their recommendations in writing to the Council before the Stated Meeting of the Academy in April.

Elections of Fellows and Foreign Honorary Members shall be made by the Council before the Annual Meeting in May, and announced at that meeting.

Persons nominated in any year, but not elected, may be carried over to the list of nominees for the next year at the discretion of the Council, but shall not be further continued unless renominated.

See Chap. ii; chap. vi, art. 1; chap. x, art. 1.

CHAPTER IV.

Officers.

Article 1. The Officers of the Academy shall be a President (who shall be Chairman of the Council), four Vice-Presidents (one from each Class), a Corresponding Secretary (who shall be Secretary of the Council), a Recording Secretary, a Treasurer, a Librarian, and an Editor, all of whom shall be elected by ballot at the Annual Meeting, and shall hold their respective offices for one year, and until others are duly chosen and installed.

There shall be also sixteen Councillors, one from each Section of each Class. At each Annual Meeting four Councillors, one from each Class, shall be elected by ballot to serve for the full term of four years and until others are duly chosen and installed. The same Fellow shall not be eligible for two successive terms.

The Councillors, with the other officers previously named, and the Chairman of the House Committee, *ex officio*, shall constitute the Council.

See Chap. xi, art. 1.

ARTICLE 2. If any officer be unable, through death, absence, or disability, to fulfill the duties of his office, or if he shall resign, his place may be filled by the Council in its discretion for any part or the whole of the unexpired term.

ARTICLE 3. At the Stated Meeting in March, the President shall appoint a Nominating Committee of four Fellows having the right to vote, one from each Class. This Committee shall prepare a list of nominees for the several offices to be filled, and for the Standing Committees, and file it with the Recording Secretary not later than four weeks before the Annual Meeting.

See Chap. vi, art. 2.

ARTICLE 4. Independent nominations for any office, if signed by at least twenty Fellows having the right to vote, and received by the Recording Secretary not less than ten days before the Annual Meeting, shall be inserted in the call therefor, and shall be mailed to all the Fellows having the right to vote.

See Chap. vi, art. 2.

ARTICLE 5. The Recording Secretary shall prepare for use in voting at the Annual Meeting a ballot containing the names of all persons duly nominated for office.

CHAPTER V.

THE PRESIDENT.

ARTICLE 1. The President, or in his absence the senior Vice-President present (seniority to be determined by length of continuous Fellowship in the Academy), shall preside at all meetings of the Academy. In the absence of all these officers, a Chairman of the meeting shall be chosen by ballot.

ARTICLE 2. Unless otherwise ordered, all Committees which are not elected by ballot shall be appointed by the presiding officer.

ARTICLE 3. Any deed or writing to which the Corporate Seal is to be affixed, except leases of real estate, shall be executed in the name of the Academy by the President or, in the event of his death, absence, or inability, by one of the Vice-Presidents, when thereto duly authorized.

See Chap. ii, art. 7; chap. iv, art. 1, 3; chap. vi, art. 2; chap. vii, art. 1; chap. x, art. 6; chap. xi, art. 1, 2; chap. xii, art. 1.

CHAPTER VI.

THE SECRETARIES.

ARTICLE 1. The Corresponding Secretary shall conduct the correspondence of the Academy and of the Council, recording or making an entry of all letters written in its name, and preserving for the files all official papers which may be received. At each meeting of the Council he shall present the communications addressed to the Academy which have been received since the previous meeting, and at the next meeting of the Academy he shall present such as the Council may determine.

He shall notify all persons who may be elected Fellows or Foreign Honorary Members, send to each a copy of the Statutes, and on their acceptance issue the proper Diploma. He shall also notify all meetings of the Council; and in case of the death, absence, or inability of the Recording Secretary he shall notify all meetings of the Academy.

Under the direction of the Council, he shall keep a List of the Fellows and Foreign Honorary Members, arranged in their several Classes and Sections. It shall be printed annually and issued as of the first day of July.

See Chap. ii, art. 7; chap. iii; chap. iv, art. 1; chap. x, art. 6; chap. xi, art. 1; chap. xii, art. 1.

ARTICLE 2. The Recording Secretary shall have the custody of the Charter, Corporate Seal, Archives, Statute-Book, Journals, and all literary papers belonging to the Academy.

Fellows borrowing such papers or documents shall receipt for them to their custodian.

The Recording Secretary shall attend the meetings of the Academy and keep a faithful record of the proceedings with the names of the Fellows present; and after each meeting is duly opened, he shall read the record of the preceding meeting.

He shall notify the meetings of the Academy to each Fellow and by

mail at least seven days beforehand, and in his discretion may also cause the meetings to be advertised; he shall apprise Officers and Committees of their election or appointment, and inform the Treasurer of appropriations of money voted by the Academy.

After all elections, he shall insert in the Records the names of the Fellows by whom the successful nominees were proposed.

He shall send the Report of the Nominating Committee in print to every Fellow having the right to vote at least three weeks before the Annual Meeting.

See Chap. iv, art. 3.

In the absence of the President and of the Vice-Presidents he shall, if present, call the meeting to order, and preside until a Chairman is chosen.

See Chap. i; chap. ii, art. 7; chap. iv, art. 3, 4, 5; chap. x, art. 6; chap. xi, art. 1, 2; chap. xii, art. 1, 3.

ARTICLE 3. The Secretaries, with the Editor, shall have authority to publish such of the records of the meetings of the Academy as may seem to them likely to promote its interests.

CHAPTER VII.

THE TREASURER AND THE TREASURY.

ARTICLE 1. The Treasurer shall collect all money due or payable to the Academy, and all gifts and bequests made to it. He shall pay all bills due by the Academy, when approved by the proper officers, except those of the Treasurer's office, which may be paid without such approval; in the name of the Academy he shall sign all leases of real estate; and, with the written consent of a member of the Committee on Finance, he shall make all transfers of stocks, bonds, and other securities belonging to the Academy, all of which shall be in his official custody.

He shall keep a faithful account of all receipts and expenditures, submit his accounts annually to the Auditing Committee, and render them at the expiration of his term of office, or whenever required to do so by the Academy or the Council.

He shall keep separate accounts of the income of the Rumford Fund, and of all other special Funds, and of the Appropriation thereof, and render them annually.

His accounts shall always be open to the inspection of the Council.

ARTICLE 2. He shall report annually to the Council at its March meeting on the expected income of the various Funds and from all other sources during the ensuing financial year. He shall also report the names of all Fellows who may be then delinquent in the payment of their Annual Dues.

ARTICLE 3. He shall give such security for the trust reposed in him as the Academy may require.

ARTICLE 4. With the approval of a majority of the Committee on Finance, he may appoint an Assistant Treasurer to perform his duties, for whose acts, as such assistant, he shall be responsible; or, with like approval and responsibility, he may employ any Trust Company doing business in Boston as his agent for the same purpose, the compensation of such Assistant Treasurer or agent to be fixed by the Committee on Finance and paid from the Funds of the Academy.

ARTICLE 5. At the Annual Meeting he shall report in print all his official doings for the preceding year, stating the amount and condition of all the property of the Academy entrusted to him, and the character of the investments.

ARTICLE 6. The Financial Year of the Academy shall begin with the first day of April.

ARTICLE 7. No person or committee shall incur any debt or liability in the name of the Academy, unless in accordance with a previous vote and appropriation therefor by the Academy or the Council, or sell or otherwise dispose of any property of the Academy, except cash or invested funds, without previous consent and approval of the Council.

See Chap. ii, art. 4, 5; chap. vi, art. 2; chap. x, art. 6; chap. xi, art. 1, 2, 3; chap. xii, art. 1.

CHAPTER VIII.

THE LIBRARIAN AND THE LIBRARY.

ARTICLE 1. The Librarian shall have charge of the printed books, keep a correct catalogue thereof, and provide for their delivery from the Library.

At the Annual Meeting, as Chairman of the Committee on the Library, he shall make a Report on its condition.

ARTICLE 2. In conjunction with the Committee on the Library he shall have authority to expend such sums as may be appropriated by the Academy for the purchase of books, periodicals, etc., and for defraying other necessary expenses connected with the Library.

ARTICLE 3. All books procured from the income of the Rumford Fund or of other special Funds shall contain a book-plate expressing the fact.

ARTICLE 4. Books taken from the Library shall be receipted for to the Librarian or his assistant.

ARTICLE 5. Books shall be returned in good order, regard being had to necessary wear with good usage. If any book shall be lost or injured, the Fellow to whom it stands charged shall replace it by a new volume or by a new set, if it belongs to a set, or pay the current price thereof to the Librarian, whereupon the remainder of the set, if any, shall be delivered to the Fellow so paying, unless such remainder be valuable by reason of association.

ARTICLE 6. All books shall be returned to the Library for examination at least one week before the Annual Meeting.

ARTICLE 7. The Librarian shall have the custody of the Publications of the Academy. With the advice and consent of the President, he may effect exchanges with other associations.

See Chap. ii, art. 6; chap. xi, art. 1, 2.

CHAPTER IX.

THE EDITOR AND THE PUBLICATIONS.

ARTICLE 1. The Editor shall have charge of the conduct through the press of the Proceedings and the Memoirs, and all correspondence relative thereto, and shall have power to fix the price at which individual numbers of the Proceedings and Memoirs are sold.

ARTICLE 2. In conjunction with the Committee of Publication, he shall have authority to expend such sums as may be appropriated by the Academy for printing the publications and for defraying other expenses therewith connected.

ARTICLE 3. All publications which are financed in whole or in part from the income of the Rumford Fund or from the income of other

special funds, and all publications of work done with the aid of the Rumford Fund or other special funds, shall contain a conspicuous statement of this fact.

ARTICLE 4. Two hundred extra copies of each paper printed in the Proceedings or Memoirs shall be placed at the disposal of the author without charge.

If, on account of the number of communications offered for publication, it shall be necessary to decline for publication communications otherwise acceptable, members of the Academy shall be given preference in each of the several Classes over non-members; but whenever it shall be necessary to exercise this preference, the Editor shall inform the Council of the fact.

See Chap. iv, art. 1; chap. vi, art. 3; chap. x, art. 6; chap. xi, art. 4.

CHAPTER X.

THE COUNCIL.

ARTICLE 1. The Council shall exercise a discreet supervision over all nominations and elections to membership, and in general supervise all the affairs of the Academy not explicitly reserved to the Academy as a whole or entrusted by it or by the Statutes to standing or special committees.

It shall consider all nominations duly sent to it by any Class Committee, and act upon them in accordance with the provisions of Chapter III.

With the consent of the Fellow interested, it shall have power to make transfers between the several Sections, reporting its action to the Academy.

See Chap. iii, art. 2, 3; chap. xi, art. 1.

ARTICLE 2. Nine members shall constitute a quorum.

ARTICLE 3. It shall establish rules and regulations for the transaction of its business, and provide all printed and engraved blanks and books of record.

ARTICLE 4. It shall act upon all resignations of officers, and all resignations and forfeitures of Fellowship; and cause the Statutes to be faithfully executed.

It shall appoint all agents and subordinates not otherwise provided for by the Statutes, prescribe their duties, and fix their compensation. They shall hold their respective positions during the pleasure of the Council.

ARTICLE 5. It may appoint, for terms not exceeding one year, and prescribe the functions of, such committees of its number, or of the Fellows of the Academy, as it may deem expedient, to facilitate the administration of the affairs of the Academy or to promote its interests.

ARTICLE 6. At its March meeting it shall receive reports from the President, the Secretaries, the Treasurer, and the Standing Committees, on the appropriations severally needed for the ensuing financial year. At the same meeting the Treasurer shall report on the expected income of the various Funds and from all other sources during the same year.

A report from the Council shall be submitted to the Academy, for action, at the March meeting, recommending the appropriation which in the opinion of the Council should be made.

On the recommendation of the Council, special appropriations may be made at any Stated Meeting of the Academy, or at a Special Meeting called for the purpose.

See Chap. xi, art. 3.

ARTICLE 7. After the death of a Fellow or Foreign Honorary Member, it shall appoint a member of the Academy to provide a biographical notice for publication in the Proceedings.

ARTICLE 8. It shall report at every meeting of the Academy such business as it may deem advisable to present.

See Chap. ii, art. 4, 5, 8; chap. iv, art. 1, 2; chap. vi, art. 1; chap. vii, art. 1; chap. xii, art. 1, 4.

CHAPTER XI.

STANDING COMMITTEES.

ARTICLE 1. The Class Committee of each Class shall consist of the Vice-President, who shall be chairman, and the four Councillors of the Class, together with such other officer or officers annually elected as may belong to the Class. It shall consider nominations to Fellowship

in its own Class, and report in writing to the Council such as may receive at a Class Committee Meeting a majority of the votes cast, provided at least three shall have been in the affirmative.

See Chap. iii, art. 2.

ARTICLE 2. At the Annual Meeting the following Standing Committees shall be elected by ballot to serve for the ensuing year:

(i) *The Committee on Finance,* to consist of four Fellows, who, through the Treasurer, shall have full control and management of the funds and trusts of the Academy, with the power of investing the funds and changing the investments thereof in their discretion.

See Chap. iv, art. 3; chap. vii, art. 1, 4; chap. x, art. 6.

(ii) *The Rumford Committee,* to consist of seven Fellows, who shall report to the Academy on all applications and claims for the Rumford Premium. It alone shall authorize the purchase of books, publications and apparatus at the charge of the income from the Rumford Fund, and generally shall see to the proper execution of the trust.

See Chap. iv, art. 3; chap. x, art. 6.

(iii) *The Cyrus Moors Warren Committee,* to consist of seven Fellows, who shall consider all applications for appropriations from the income of the Cyrus Moors Warren Fund, and generally shall see to the proper execution of the trust.

See Chap. iv, art. 3; chap. x, art. 6.

(iv) *The Committee of Publication,* to consist of the Editor, *ex officio,* as Chairman, and four other Fellows, one from each Class, to whom all communications submitted to the Academy for publication shall be referred, and to whom the printing of the Proceedings and the Memoirs shall be entrusted.

It shall fix the price at which volumes of the publications shall be sold; but Fellows may be supplied at half price with volumes which they are not entitled to receive gratis.

It shall determine when the pressure of material offered for publication makes it necessary to give preference to members of the Academy as compared with non-members, or to give priority to certain members as compared with others, and to what extent this preference or priority shall be applied in each of the four Classes, to the

end that a proper balance of the facilities of publication with respect to subject matter and authors may be maintained.

See Chap. iv, art. 3; chap. vi, art. 1, 3; chap. ix; chap. x, art. 6.

(v) *The Committee on the Library*, to consist of the Librarian, *ex officio*, as Chairman, and four other Fellows, one from each Class, who shall examine the Library and make an annual report on its condition and management.

See Chap. iv, art. 3; chap. viii, art. 1, 2; chap. x, art. 6.

(vi) *The House Committee*, to consist of four Fellows, who shall have charge of all expenses connected with the House, including the general expenses of the Academy not specifically assigned to the care of other Committees or Officers.

See Chap. iv, art. 1, 3; chap. x, art. 6.

(vii) *The Committee on Meetings*, to consist of the President, the Recording Secretary, and four other Fellows, who shall have charge of plans for meetings of the Academy.

See Chap. iv, art. 3; chap. x, art. 6.

(viii) *The Auditing Committee*, to consist of two Fellows, who shall audit the accounts of the Treasurer, with power to employ an expert and to approve his bill.

See Chap. iv, art. 3; chap. vii, art. 1; chap. x, art. 6.

(ix) *The Committee on Biographical Notices*, to consist of six Fellows, two to be elected each year, six in 1933, one of them to be a Secretary of the Academy, to see that biographical notices of the Fellows are provided.

See Chap. x, art. 7.

ARTICLE 3. The Standing Committees shall report annually to the Council in March on the appropriations severally needed for the ensuing financial year; and all bills incurred on account of these Committees, within the limits of the several appropriations made by the Academy, shall be approved by their respective Chairmen.

In the absence of the Chairman of any Committee, bills may be approved by any member of the Committee whom he shall designate for the purpose.

See Chap. vii, art. 1, 7; chap. x, art. 6.

CHAPTER XII.

Meetings, Communications, and Amendments.

Article 1. There shall be annually eight Stated Meetings of the Academy, namely, on the second Wednesday of October, November, December, January, February, March, April, and May. Only at these meetings, or at adjournments thereof regularly notified, or at Special Meetings called for the purpose, shall appropriations of money be made or amendments of the Statutes or Standing Votes be effected.

The Stated Meeting in May shall be the Annual Meeting of the Corporation.

Special Meetings shall be called by either of the Secretaries at the request of the President, of a Vice-President, of the Council, or of ten Fellows having the right to vote; and notifications thereof shall state the purpose for which the meeting is called.

A meeting for receiving and discussing literary or scientific communications may be held on the fourth Wednesday of each month, excepting July, August, and September; but no business shall be transacted at said meetings.

Article 2. Twenty-five Fellows having the right to vote shall constitute a quorum for the transaction of business at Stated or Special Meetings. Eighteen Fellows shall be sufficient to constitute a meeting for literary or scientific communications and discussions.

Article 3. Upon the request of the presiding officer or the Recording Secretary, any motion or resolution offered at any meeting shall be submitted in writing.

Article 4. No report of any paper presented at a meeting of the Academy shall be published by any Fellow without the consent of the author; and no report shall in any case be published by any Fellow in a newspaper as an account of the proceedings of the Academy without the previous consent and approval of the Council. The Council, in its discretion, by a duly recorded vote, may delegate its authority in this regard to one or more of its members.

Article 5. No Fellow shall introduce a guest at any meeting of the Academy until after the business has been transacted, and especially until after the result of the balloting upon nominations has been declared.

ARTICLE 6. The Academy shall not express its judgment on literary or scientific memoirs or performances submitted to it, or included in its Publications.

ARTICLE 7. All proposed Amendments of the Statutes shall be referred to a committee, and on its report, at a subsequent Stated Meeting or at a Special Meeting called for the purpose, two-thirds of the ballot cast, and not less than twenty-five, must be affirmative to effect enactment.

ARTICLE 8. Standing Votes may be passed, amended, or rescinded at a Stated Meeting, or at a Special Meeting called for the purpose, by a vote of two-thirds of the members present. They may be suspended by a unanimous vote.

See Chap. ii, art. 5, 8; chap. iii; chap. iv, art. 3, 4, 5; chap. v, art. 1; chap. vi, art. 1, 2; chap. x, art. 8.

STANDING VOTES.

1. Communications of which notice has been given to either of the Secretaries shall take precedence of those not so notified.

2. Fellows may take from the Library six volumes at any one time, and may retain them for three months, and no longer. Upon special application, and for adequate reasons assigned, the Librarian may permit a larger number of volumes, not exceeding twelve, to be drawn from the Library for a limited period.

3. Works published in numbers, when unbound, shall not be taken from the Hall of the Academy without the leave of the Librarian.

4. The Council, under such rules respecting nominations as it may prescribe, may elect as Associates of the Academy a limited number of men of mark in affairs or of distinguished service in the community.

Associates shall be entitled to the same privileges as Fellows, but shall not have the right to vote.

The admission fee and annual dues of Associates shall be the same as those of Fellows residing within fifty miles of Boston.

5. Communications offered for publication in the Proceedings or Memoirs of the Academy shall not be accepted for publication before the author shall have informed the Committee on Meetings of his readiness, either himself or through some agent, to use such time as the Committee may assign him at such meeting as may be convenient both to him and to the Committee, for the purpose of presenting to the Academy a general statement of the nature and significance of the results contained in his communication.

RUMFORD PREMIUM.

In conformity with the terms of the gift of Sir Benjamin Thompson, Count Rumford, of a certain Fund to the American Academy of Arts and Sciences, and with a decree of the Supreme Judicial Court of Massachusetts for carrying into effect the general charitable intent and purpose of Count Rumford, as expressed in his letter of gift, the Academy is empowered to make from the income of the Rumford Fund, as it now exists, at any Annual Meeting, an award of a gold and a silver medal, being together of the intrinsic value of three hundred dollars, as a Premium to the author of any important discovery or useful improvement in light or heat, which shall have been made and published by printing, or in any way made known to the public, in any part of the continent of America, or any of the American islands; preference always being given to such discoveries as, in the opinion of the Academy, shall tend most to promote the good of mankind; and, if the Academy sees fit, to add to such medals, as a further Premium for such discovery and improvement, a sum of money not exceeding three hundred dollars.

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